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EDITORIAL NOTES.

The Chemical Manufacturers and Protection.

THE question whether the interests of the whole gas industry, and of the millions of the community that it serves, are to be disregarded in order that the interests of the principal chemical manufacturers of the country may be served, and additional commercial advantage of an extraordinarily privileged kind be conferred upon them by Parliament, was argued last week for three days before the Joint Committee of the two Houses of Parliament, ably presided over by Mr. J. W. Hills. The issue the Committee have to decide is whether or not there is to be any limitation imposed on the gas industry in respect of its dealings in residual products, or whether the industry is to have freedom in its dealings so as to be on equal trading terms not only with the chemical manufacturers, but with all the other producers of certain of the secondary products of gas-works. In saying this, the Committee will also say whether or not the chemical manufacturers are to be favoured by any special protection, and through the process set up in the present session (during which its application was of the follow-my-leader kind) be granted ruling powers over prices for the raw secondary products of the gas industry, or whether they are, like all other traders, to face the competitive conditions (which are of economic value to the whole community) of ordinary commercial life.

Before noticing the proceedings themselves, there are a couple of personal matters that should here be mentioned. For, we are satisfied, quite substantial reasons, the South Metropolitan Gas Company resolved to ask the Committee to give them a separate hearing; and for this purpose, having a standing claim on the professional services of Mr. Honoratus Lloyd, K.C., they retained him. Thus he was transferred, before he had had an opportunity of seeing the case of the Alkali Manufacturers' Association, from their side to his rightful position on the side of the gas industry. However, the Company were not granted a separate hearing, and so they threw their weight in with the general case—Mr. Honoratus Lloyd continuing in company with Mr. Balfour Browne, K.C., Mr. Hutchinson, K.C., and Mr. A. M. Paddon, who represented the gas industry, through the Gas Companies' Protection Association and the Association of Municipal Corporations. With Mr. J. D. Fitzgerald, K.C., for the Alkali Manufacturers' Association was linked Mr. Lynden Macassey, K.C. The Association, however, had another (for them) serious loss. Mr. W. R. Herring, who had helped them, so far as the question of principle up to a point was concerned in connection with individual undertakings, declined to proceed with them further now that it has come to the critical point at which determination has to be made as to whether or not restriction is to be generally applied, without further question, upon the gas industry. At this point, it would have been impossible for any friend of the industry to have joined forces with the Alkali Manufacturers, whose movement, as Mr. Corbet Woodall, the President of the Institution, aptly said in his evidence, was manifestly an attack, and not a defence. We cannot help feeling that, when Mr. Herring was first of all retained by the Alkali Manufacturers' Association, he did not (as was the case with others in the industry) fully appreciate the goal of protection and control to which the chemical manufacturers were bent on driving.

The chemical manufacturers' case occupied the first and a large part of the second day's sittings. But frankly we do not think it has ever fallen to our lot, in a historical inquiry of this kind, to listen to a weaker case, one containing more illogical admissions, and one the parts of which so stubbornly refused to hang together to make a respectable whole. It was impossible for the witnesses one after the other to deny (though they fenced with the point) that they were out for trade protection and special privileges, and that the protection and privileges would be against the economic interests of the gas industry. They failed completely to show the Committee why they should be protected against gas undertakings buying raw products (if it was to the interest of those chiefly concerned) from less influential neighbours; and they failed to show any guarantees of protection for the gas industry against the chemical manufacturers injuring it by being placed in a position from which they could control the prices of a large part of the industry's secondary produce. It was highly amusing to hear the chemical manufacturers' witnesses, with an earnestness admirable only in a selfish commercial cause, telling the Committee that they did not want their markets for purchase restricted; but adroitly omitting to show the Committee why gas undertakings—especially the small and medium sized ones—should have their markets for sale restricted. Naturally, the chemical people do not want their markets for purchase limited. But why they should obtain privilege by the curtailment of the markets of the sellers was not told in their evidence.

It was somewhat reluctantly acknowledged by witnesses for the chemical manufacturers, under Mr. Balfour Browne's poignant cross-examination, that "free" competition for raw residuals would be narrowed-down to their own ranks, and that it was possible the chemical manufacturers might, under the new conditions, be able to obtain their raw materials at a somewhat lower price if gas undertakings were forced out of the field as the potential markets of neighbouring concerns. And let this be clearly understood by all gas managements: It was admitted by Mr. Fitzgerald that the chemical manufacturers want to have the restriction applied to those gas undertakings that are at present open markets for, and doing actual business with, other gas undertakings for ammoniacal liquor, tar, and spent oxide, as well as to undertakings that do not at present buy, owing to fair prices being procurable under existing conditions in other directions. That is the clearest possible confession of the selfish desire of the chemical manufacturers to be the sole markets for the bye-products of gas manufacture other than coke. Of course, the chemical manufacturers all repudiated the existence of rings, combinations, and understandings in their trade. And one therefore wonders for what purpose, in the ordinary way, their organizations are in existence, until one hears from a witness—Mr. Perry—that within his knowledge there may have been a little "correcting" done with the view to regulating the output of sulphuric acid; and from Mr. Charles Carpenter, on the other side, of a company who could not get a fair quotation for sulphuric acid, owing to one chemical firm refusing to quote against another. It is quite plain that there is actual evidence of something that exists to a larger degree in possibility, and that will materialize if ever the chemical manufacturers get protection, and thereby their chance.

There is one point that has not yet been made sufficiently clear to the Committee, and it is that, although a gas undertaking has in a given area a monopoly in the sale of gas (such as the "monopoly" is, with electricity, oil, suction gas and producer gas, air gas, and acetylene in the field against them), they have no monopoly in the district in the sale of coke, breeze, tar, sulphate of ammonia, or anything else they may produce as a consequence of the manufacture of their primary product. It would be absolutely and economically impossible for the sale of these articles, transportable by ordinary means, to be confined in their sale to the district of production; it would be distinctly against the interests of the community for a sale monopoly in them to exist in any district. The gas undertakings can compete with one another in these things; the chemical manufacturers and tar distillers can, either direct or through their agents, compete with any gas undertaking in the supply of sulphate of ammonia, sulphuric acid, or tar, or any of the products of the gas concerns that distil their own tar. There are free markets in this respect. The chemical manufacturers and tar distillers would cry out if there were not free markets

for them in the areas of gas undertakings. There being this universal freedom in this particular direction, why should there not be the same universal freedom in the disposal to the best possible advantage of the ammoniacal liquor, tar, and spent oxide? The answer to this, in view of the no-monopoly position of gas undertakings in the sale of their secondary products, has not been presented to the Committee. Gas undertakings in these matters are but ordinary traders, the same as the chemical manufacturers; but the chemical manufacturers are asking Parliament to impose a restriction on gas undertakings, and a penalty on production, without taking upon themselves any corresponding obligation. The Committee were anxious to know what has been the practice of Parliament in this matter. The practice of Parliament has been for freedom over a long course of years; and the restriction of the present session does not reflect the practice of Parliament through those many decades. Mr. Balfour Browne made a point in regard to this when he stated that, in evidence before the Municipal Trading Committee in 1900, both Sir Courtenay Boyle, then Permanent Secretary to the Board of Trade, and Mr. Albert Gray, the Counsel to the Lord Chairman, expressed the view that gas-works should have the power to deal in residual products, as this was an important factor in determining the price of gas.

Bearing upon this point, however, Mr. Fitzgerald seems to be most unfortunate when he attempts to draw a parallel, in order to illustrate the practice of Parliament. A time ago, he pointed out that Parliament does not allow gas undertakings to make gas-fittings—apparently overlooking the fact that gas undertakings do not produce metal as a secondary product of gas manufacture. He now points to the fact that Parliament does not allow railway companies to sell coal—apparently quite overlooking the fact that coal is not a secondary product of the running of trains. Mr. Carpenter settled the attempted analogy by reminding the Committee that railway companies are allowed to put up large hotels at their termini to compete with the ordinary hotel keepers of cities and towns, as well as to run steamboats and do other things in competition with private traders. All the gas companies ask for is the right to do as they like with their own secondary produce in open markets, and that the present conditions may be maintained, under which the chemical manufacturers will not suffer, as there is no intention on the part of gas undertakings generally to enter upon the larger work of chemical manufacture. Only the exceptionally big concerns can do this, as they have a legitimate right to do, in view of the nature of their business, and in the interests of their consumers and the public. There is another point. As the chemical clause now stands, and as we read it, no gas undertaking that has had it imposed upon it can, in the event of its own resources proving inadequate to fulfil its contracts for coke, tar, or sulphate of ammonia, purchase from its neighbours to complete its contracts. If a chemical manufacturer desires to supplement his own production to fulfil his contracts, he can purchase from another chemical manufacturer. But he would deny a like privilege to a gas undertaking. Such restriction to free commerce is simply absurd and against common sense.

The Committee heard a good deal of the phantasms of the imaginations of the chemical manufacturers. They talk of the highly speculative character of their business, and that gas undertakings ought not, in view of this assumed speculative character, to be allowed to go outside their own production for raw materials. In other words, by the limitation, they would make the business for gas undertakings more speculative still. They themselves do well out of this speculative business; the principal representative firms of the chemical business make enormous dividends. Like Oliver Twist they "want more" of the speculative—and if speculative, a wonderfully elastic—business, by keeping others as far as possible from participating in it. So keen are they to get more of it, too, that they are asking Parliament to preserve them from having to face ordinary commercial competition, and to prevent the community from enjoying the benefit of open competition. The evidence so far has shown (perhaps the further evidence will show it still more) that the country is the better off for the competition. The gas undertakings of no other countries have any such restriction as the one contemplated here imposed upon them; as a matter of fact, in Germany the gas-works have a Co-operative Society for the disposal of their products [see "JOURNAL," June 25, p. 999]. We hope that the outcome of the inquiry will be that the gas industry will not be placed in an inferior position to the chemical manufacturers by protection and control of prices being accorded to the latter. The maintenance of the present equality in commercial position, and the maintenance of open markets, are the only ways in which Parliament can, in this matter, award justice. That is all the gas industry are asking for at the hands of the Joint Committee.

Gas Work for Next Session.

IN this issue, the list is completed of the Bills and Orders that are promised for next session in which gas has part; and certain of the notices foreshadow interesting features. Before referring to these matters, however, we may remind promoters that the inquiry is now proceeding to determine whether or not there is to be restriction imposed in respect of dealings in residual products. Until the decision of the Joint Committee is known, there should be no implied acquiescence on the part of promoters in accepting the limitation by following the newly issued Model Clauses which prematurely premeditate restriction either in terms of the chemical clause, or by the insertion of the words "by them" in the general purposes clause or in any other convenient provision. Promoters may take it for granted that, if the Joint Committee decide against the gas industry, the restriction will find its way into their measures before the session is over without any initial movement to that end on their own part. The care promoters must exercise is to see that the restriction does not appear in their draft Bills as lodged, simply on the ground that it has been incorporated in the Model Clauses.

To pass to the notices. There are in all twenty-nine Bills promised in which gas is concerned, eleven being promoted by local authorities. The total includes one emanating from the London County Council to empower the Metropolitan Borough Councils to attach to buildings, for the purpose of public lighting, brackets, pipes, wires, lamps, and other apparatus; and also one by the South Staffordshire Mond Gas Company. Therefore, we can only count upon twenty-seven Bills directly applying to town gas undertakings. The presence of the South Staffordshire Mond Gas Company in Parliament suggests that, if the residuals restriction is recommended by the Joint Committee, the Alkali Manufacturers' Association or else the Parliamentary Authorities should see that the limitation is imposed on the Company. To fatten slightly this quantitatively thin session, there are, on the part of gas undertakings, eleven applications to the Board of Trade for Provisional Orders, and one to the Local Government Board. There is also one gas measure among the applications to the Secretary of Scotland, under the Private Legislation Procedure (Scotland) Act. We cannot anticipate from these numbers that work will be very brisk next session in the Committee rooms in connection with gas supply, though there are measures that contain something more than normal features.

The ordinary powers of Gas Bills are plentifully indicated in the notices—such as new capital, extensions of limits and of works, annexation of unoccupied area of neighbouring concerns, quality and testing powers, stand-by clauses, and special purposes and reserve funds. One of the most interesting features is the continuation of the policy of the absorption of small gas undertakings by their larger neighbours. We have now witnessed this movement over several sessions. The most important scheme for next session is the proposal of the Tottenham and Edmonton Company to acquire the undertaking of the Enfield Company; and the Bournemouth Company are projecting the improvement of the fortunes of Christchurch by taking over the gas concern. The Blyth and Cowpen Company have their eyes on the Bedlington Gas Company. The Grays and Tilbury Company have five small concerns that they are contemplating taking under their wing; and as there is a little promoting history attached to one or two of the undertakings, the Grays and Tilbury Company will be doing something really serviceable for the areas concerned. The undertakings that the Company propose to add to their own are Stanford-le-Hope, Laindon, Ingatestone, Rayleigh, and Billericay. A Company answering to the title of the Counties Gas Company purpose changing the appellation to the United District Gas Company, and to consolidate the fortunes of a number of small gas undertakings in the counties of Oxford, Bucks, Northampton, and Wilts. Among the notices for Provisional Orders, it is observed that the Faversham Gas Company are intending to take under their care the Boughton

Blean Gas Company. Purchases by local authorities do not bulk at all largely. The York Corporation contemplate consummating the purchase clause and agreement that appear in the York Company's Act of this session; while the Biddulph District Council seek the confirmation of Parliament to the purchase of the local gas concern. There are also one or two schemes for the purchase by local authorities of portions of existing undertakings.

Another notable feature of the notices is the number of gas companies who are proposing to ask for electricity supply powers. Flourishing as the Tottenham and Edmonton Company have been, are, and still promise to be as a gas concern, they are desirous of taking over the electricity powers of the Wood Green District Council, and to be henceforth known as the Tottenham District Light, Heat, and Power Company. We like the title, as it expresses fully the primary activities of a gas undertaking; and yet there is a little sentiment over retaining "gas" as part of the title, seeing the favour in which substantial gas undertakings are now held by the investing public. There is the Herne Bay Company, too, proposing to take upon themselves the electricity powers of the District Council. Four other gas undertakings—Crowborough, Ely Valley, Porthcawl, and Westgate and Birchington—are asking by Bill for full electricity powers. Other concerns—the Grays and Tilbury Company for example—are desirous of obtaining sanction to apply for an Electricity Order. The Truro Gas Company appear to be in competition with the Corporation for an Electricity Provisional Order.

Several of the notices refer to the quality and testing of gas. But the Morley Corporation are the only promoters who directly intimate their intention of applying for the substitution of a calorific power standard and test, in place of the illuminating power ones. There are three Companies now with parliamentary calorific power standards and tests; but the Morley Corporation will rank first in giving notice of their intention to ask for the change, and they will be the first likewise among local authorities (if the Bill passes) to make this progressive move. The West Bromwich Corporation are going for a Bill that will invest them with extended commercial powers. The Worthing Gas Company propose to ask Parliament to legalize their doings in the matter of any reasonable interference with underground tunnels when laying their mains—one result of the litigation in which they were involved some time since. The Harrow Company are proposing the consolidation of their capital; and the further blessing of Parliament on co-partnership will be sought in the Harrow and Tynemouth measures, and in the South Staffordshire Mond Gas Bill. From this review, so far as review is possible within the delineations of the notices, the session promises some interest, though not of an extensive order.

Coal Heating and Firing.

Coal stacking in relation to coal heating and firing is a subject to which renewed attention has been given lately, possibly owing to changed circumstances compelling the holding of larger stocks by users against the greater liability to vexatious emergencies. Too much attention cannot be given to the question, particularly in respect of the causes of heating and spontaneous combustion in stacked coal, in view of the fact that still erroneous beliefs hold large sway, and contribute to trouble through the promotion and continuance of wrong practices. In the "Journal" there has recently been thorough examination made of the position of knowledge on the subject. Even now, however, opinions and views are in a measure theoretical, though there is no question that a truer scientific explanation of the causes is available, although the causes are of a somewhat manifold character. A spacious survey of the latest information on the subject was made in the paper that Mr. H. Kendrick prepared for the meeting of the Manchester Institution of Gas Engineers on Saturday, at which, too, the President (Mr. Samuel Glover) gave some interesting micro-photographs illustrating the structure and composition of various coals, a study of which (and his explanation) shows the large variation that exists in the highly inflammable substances in coals, even from different parts of the same seams. Mr. Kendrick used the experiences in his own coal-stores at Stretford as the groundwork for the investigation that he made of the general subject; and he gave some most valuable tables in which experiences are collected that are enlightening as to the part that the mode of stacking and the variety of the coal play in producing trouble.

It does not always follow that the coal *per se* is the originating cause of the heating that gives rise to what is called spontaneous combustion. It may be that the initial cause is a structural defect in the stores themselves, or the proximity of a source of heat that raises the temperature of the coal, and thus renders it more active in oxygen absorption than it would be otherwise. It is rather interesting to examine Mr. Kendrick's coal-stores in the light of his experiences and the later knowledge on the general subject. We see that there has been more trouble in No. 1 coal-store than in Nos. 2 and 3. Now there are two noticeable distinctions between No. 1 house (which is a disused retort-house) and the others. The first is this, that No. 1 house has, in part, a louvred roof; No. 2 has not; and No. 3 has a corrugated iron roof. The second point is that it is possible to store to a depth of 24 feet in No. 1 shed; while in Nos. 2 and 3, the storage is to a less depth. The 24 feet depth exceeds that which coal owners and other authorities advise as the maximum depths in enclosed stores—13 to 16 feet being the maximum to which they suggest enclosed storage should go. We have no knowledge as to other structural details of the stores; and so it can only be taken as a surmise that possibly the partly louvred roof and the greater depth of the coal stored in No. 1 house are accountable. through the increased circulation of air that may be promoted in the coal itself, for the fact that "most" of the troubles have occurred in this No. 1 store. The fact that this greater trouble has been experienced in the one house is rather peculiar, and suggests that the originating cause of difficulty is as much local as due to the coal itself, seeing that the variety of coal received has much in common—at any rate in Nos. 1 and 2 houses.

It is next noticed that great care is taken to avoid the finer dust being stacked with the other coal. All authorities do not agree that the dust should be eliminated in stacking (though there is agreement that it should not be allowed to accumulate in volume); but rather that, as far as possible, it should be mixed with the larger coals so as to seal the passages in the latter, and thus prevent that circulation of air which supplies additional oxygen to the coal, promotes heating, and, if combustion starts, supports it. If the tables are examined, it will be noticed that where the coal is stacked by hand, and the fine, small, and large are thus thoroughly mixed, there appears to be little trouble; and it is only where, chiefly in mechanical stacking, there are considerable accumulations of dust that the dust is the seat of difficulty. This fact gives countenance to the theory as to the advantage of sealing the channels in the bulk of the larger stored coals.

But notwithstanding the care taken at Stretford to prevent the fine dust and small getting into store, there is an accumulation of dust and of small coal to which Mr. Kendrick attributes many of his troubles in No. 1 store. But there appears to be an apparent contradiction in one experience which he relates, where it was found that the fire had spread to the nuts, and not to the slack—the nuts had, in fact, "caked into a solid mass, while the intervening "layers of slack were quite loose, though very hot." A little later, however, Mr. Kendrick points out that under the conveyor the continuous layer of dust was very hot, and often broke into flames when disturbed and air admitted to it, which is precisely what might be expected. Yet this particular fire does not seem to have started where the dust had most accumulated. Mr. Kendrick also speaks of the use of temperature tubes for watching the temperatures of the heaps. In this respect again, permanently installed tubes have been proved in some instances to have assisted in the promotion of the circulation of air through the coal; and this circulation is clearly something to be avoided.

Another interesting point is raised by Mr. Kendrick. He thinks that succeeding the coal strike, the conditions under which coals were mined and rapidly stored, with the weather dry and hot, and the temperatures of the slacks as delivered being higher than usual (no exact temperature tests appear to have been made just then by Mr. Kendrick), caused the coals "to be much more liable to spontaneous combustion "than those mined and stored under more normal conditions, "as witness the large number of fires reported in the past "few months." Mr. Kendrick's tables do not seem to confirm this; and, from our own knowledge, it does not apply to certain works down south. The coal owners are not of opinion that the coals mined and delivered in May last were unduly hot; and certainly they could not have been hotter

than coals that were put into stock during the summer of 1911. But there appears to be some contradiction by Mr. Kendrick of the foregoing quoted statement under the section of his paper distinguished by the cross line "Weather "Conditions." He says there: "The higher temperature "of the atmosphere in April and May may have prevented "the cooling of the coals put into stock and in transit, but "could hardly, in this country, be responsible for fires." However, after carefully perusing the paper, and extracting the lessons of the tables, we are left with further confirmation that the factors contributing to the heating and spontaneous combustion of stored coal are many; but Mr. Kendrick has done excellent service in making a survey of these factors, in expressing his personal views from his experiences, and in assembling, as he has done in his tables, the experiences of other gas engineers under diverse local conditions.

Measuring the Flow of Gas in Pipes.

We cannot allow the publication last week of the paper by Mr. A. R. Griggs, on the measurement of the flow of gas by the Pitot tube, read before the Southern Juniors, to pass without an acknowledgment of the large amount of careful and original work that the contribution contained. The paper exhibits care, competence for such research, and much originality; and these are qualities that we like to see in papers submitted to our technical organizations. It is true that those who have followed the literature of the subject treated upon in the paper will recognize that certain of the ground which Mr. Griggs traversed was earlier covered by Mr. J. W. Batten in his contribution to the proceedings of the American Gas Institute last year [see "Journal," Dec. 19, p. 835]; but though we rather fancy the American paper had been studied by Mr. Griggs before entering upon his own work, and so prior to writing his paper, this must not detract from the originality found in the more recent contribution, which is valuable because much of it has been derived from actual experiment. It may be at once taken for granted that anyone starting on similar work in the future will as a preliminary to doing so refer to the results of Mr. Griggs' research.

A paper of this kind is not discussable to any particularly useful degree, except by those who have carried out similar investigations; and there is no intention here to talk round about the subject. But there are two or three commentable points that will suggest themselves to anyone who has taken an interest in the general subject. In the first place, it strikes one, on looking at the arrangement in the first illustration, that suction effect in the static pressure tube would disturb results. In the text of the paper there is confirmation of this; and the disturbance, it is found, is obviated by special devices. And here it may be said that the micro-manometer devised by Mr. Griggs is very ingenious. The point may be offered for consideration that it would, in all probability, prove an advantage to have a gas reservoir for the static pressure tube, to act as a buffer, and to tone down any fluctuations.

There is not the slightest doubt that the Pitot tube does prove that the velocity of flow varies across the diameter of a pipe, and depends upon the distance from the centre of the pipe. This reminds us of the interesting communicated article that appeared in our columns on Feb. 22, 1910, from the pen of that authority on the subject, Mr. F. S. Cripps, Assoc.M.Inst.C.E., in which he particularly pointed to this variation in the velocity of flow across the diameter of a pipe. In the same article, he directed attention, for the first time we believe, to the lining of "dead" gas around the circumference of a pipe. He illustrated this by an arrowed sketch, showing the varying velocities across the section. The same article indicated Mr. Cripps's view that the variation in velocity across the pipe section would not be the same for all sizes of pipes—that is to say, supposing the point of mean velocity is 70 per cent. of the radius from the centre for a 22-inch main, it would not of necessity be 70 per cent. for a 1-inch tube. It follows that the presence of eddy currents and the size of the Pitot tube are not the only things to consider. The size of the main is also a factor in the case; but we did not observe on reading the paper that Mr. Griggs dealt with this point. The position of the mean flow would also vary with the roughness of the pipe, which has relatively more influence in retarding the skin flow in a small pipe than in a large one. However, in (this should be emphasized) careful hands, the Pitot tube is undoubtedly useful and reliable. It reveals more delicately and accurately the behaviour of gas when passing through a pipe than any other contrivance known.

What of the Suburbs?

Gas undertakings have an opportunity of rendering considerable service to localities on the borders of large towns and districts by assisting in the effort to distribute trade, instead of allowing it to gravitate to a single area, and so become concentrated; and this, it may be contended, is to the interest of gas concerns. In all things, in the present day, we are in a state of continuous and keen competition. The means of locomotion in our large centres and their environs are examples. The motor bus has practically put the old horse bus off our streets; and now the rivalry between the electric tramways and the motor buses is of the severest. In the Metropolis there is the further competition of the tube railways with the surface means of rapid conveyance. But the suburbs of London and other large centres claim our immediate interest. Motor buses and tramways have penetrated them, and have afforded quick and cheap means of transit between the suburbs and the large centres. When tramway and motor bus schemes were first mooted, they were joyously welcomed, as introducing new life, by the residents in suburban localities—save perhaps those living on the immediate routes selected. Even many tradesmen who occupy seats on the local councils lent their voices and influence in the advocacy and promotion of these rapid means of locomotion. But they of the suburbs in many cases to-day wish they had not done so. What is the result? Many of the old customers of the local tradesmen, with the advent of rapid and cheap district locomotion, have transferred their patronage. They have now the facilities for quickly reaching larger shopping centres; and they take advantage of this—probably for two reasons: First, that a greater choice of goods is afforded; secondly, because those larger shopping centres are frequently much better lighted at evening-time, and there is more "life" in the streets. In fact, there is, generally speaking, no comparison between the attractions of such localities and the dull, spiritless streets of the outer districts. The result of the new means of transit is that the rich tradesmen of the more attractive neighbourhood grow richer, and the poorer tradesmen of the less attractive neighbourhood grow poorer. We have seen several areas that have undergone a wonderful transformation in the wrong direction solely owing to this new order of things.

The tradesmen in certain of these areas are beginning to analyze the causes of the current effects, which they feel in a manner that is plainly evident. And they find they have before them the task of competing not only with the means of quick locomotion, but with the attractions of the more opulent shopping areas. This, it must be confessed, is a serious task; but for some local tradesmen, if absolute ruin has not to be faced by being stripped of business by the new conditions, something has to be done. One of the first things that call for attention is the improvement of the incentives to people to remain in their own local shopping thoroughfares, and one of the means of doing this is for the tradesmen to have their shops externally well lighted in order to produce in the streets the life and attractiveness that work such marvels for those areas that are at once their envy and their rivals. Such a suburb of London as West Norwood does not often specially concern us; it concerns us now, as it affords an apt illustration of what has happened and what will continue to happen, unless the tradesmen of the smaller suburbs do something to help themselves, and to call to their aid those who are in a position to help them. The tradesmen of this particular suburb are wise. They see those with whom they ought to be doing business being carried for a penny from their very doors to the larger shopping areas—particularly at evening-time, and most important of all on Saturday evenings. They have, we see from a newspaper report before us, formed a local Chamber of Commerce; and one of the first things that is receiving attention is the question of improved lighting. They have found friends in the South Metropolitan Gas Company who are rapidly laying through their main shopping street high-pressure gas-mains, and are supplying lamps for outside shop lighting on reasonable terms, with the view of helping the tradesmen to make the street inviting to the residents in the evening. The electricity supply people are also, it is said, offering special terms. The importance of modern lighting—lighting such as high-pressure gas affords, that will

show goods up in their true colours, and this with lamps that will not flicker, but will give a steady and reliable illumination, lamps that will not injure the eyes of people by excessive glare, and lamps that will not be suddenly extinguished as the evening business is at its height—in competing with other areas, and in building up their business, is recognized by the shrewd business men of this locality. Proof of the importance has been found in many other districts. People will go to areas at night time where there is light; and good lighting, it may be taken as an axiom, is an essential to trade.

The illustration, and the assistance that is being offered to the tradesmen of West Norwood by the South Metropolitan Gas Company—true, for their mutual benefit—serve to show how gas undertakings can help in mending the trade fortunes of suburban areas under the conditions of modern change in the matter of locomotion and the increased attractions of the richer shopping areas. No gas undertaking is completely equipped to-day that has not its high-pressure main to demonstrate, and to trade in, the highest lighting efficiency attainable with gas. Such demonstrations in extensive gas-supply areas require to be distributed, and not confined to a single area; and through such distribution, as we say, mutual good between gas supplier and local tradesmen accrues. Of course, no gas undertaking wants to carry on any branch of business without making a profit on it. But at the inception of this business, before the high-pressure main becomes well loaded, it must be remembered that there is in it an advertisement of the higher capabilities of gas.

Examinations Report.

The principal features of the annual report, as far as they relate to "Gas Engineering and Gas Supply," of the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.), are published in other columns. Taking the two subjects together in which we are principally interested, the report shows a marked drop in the number of students—no less than 178. Naturally we cannot expect the supply of students to always remain at high-water mark. Relatively the number of candidates who presented themselves for examination showed only a small drop—32. The aggregate number of candidates in the two subjects was 667—the division being: 260 in "Gas Engineering," and 407 in "Gas Supply." We are pleased to see, though it means a terrible amount of work for the examiner, that there is such a quantitative attestation of the value of the "Gas Supply" examinations. We should like to see the proportion of failures further reduced, as there is the evidence in it of unpreparedness, though failure in examination is often due not to want of knowledge so much as to other personal characteristics which militate against the free expression of replies under the circumstances of a trial of ability of this particular kind. The reports of the Examiner in "Gas Engineering" (Mr. Thomas Glover) and of the Examiner in "Gas Supply" (Mr. Walter Hole) will be read with interest. In both instances, the reports are encouraging to candidates, though sufficiently critical to induce effort on the part of future candidates to do better than their predecessors by taking heed of the comments of the Examiners, whose sole interest in making their criticisms is that of the candidate.

New Views on High-Pressure Lighting.

One always looks for originality from Mr. Walter Grafton when he contributes anything to one of our technical Associations; and he fully maintained his reputation for independent thought in the excellent paper that he read before the Western Division of the Scottish Junior Association on Saturday. The subject was high-pressure lighting; and the paper was mainly an account of the results that are being achieved with the different types of lamps that have been erected in certain of the Glasgow streets. Mr. Grafton's experiences with the inverted burner for street lighting—with both high and low gas pressures—make him wonder why there are still so many upright burners in the street lamps of our cities and towns. The answer is that enterprise in effecting conversion is a matter of extraordinarily slow growth with the responsible authorities. However, high-pressure lighting is the main theme of the communication. Very valuable experience in this direction is being obtained from Glasgow, because the Gas Department has adopted a variety of compressors and of types of high-pressure lamps, with various forms of central and column suspension; and the pressures, mantles, globes, and everything appertaining to the highest efficiency have been, and are, matters of experiment. The paper gives us a peep at the thoroughness with which the high-pressure lighting business is being introduced; and, for local conditions, Glasgow intends to have the best that is going. We cannot traverse the whole of the paper to accentuate what have, so far, been the experiences; readers must do that for themselves.

Example Points.

There are, however, certain points that are worth particular notice. It is seen that, in the matter of central suspension, the Glasgow Gas Department has an improved method, which it is thought overcomes the shortcomings of the others with which trial is being made. We should like a more detailed account of this method of suspension. Mr. Grafton, it is also remarked, does not think that a pressure so high as 80 inches is necessary with Glasgow gas, if a simple alteration is made in the lamps; and when his tests show, at a pressure of 54 inches, an efficiency of 64·3 candles per cubic foot, and at 80 inches 59·53 candles, he has evidence supporting his contention. But in London though pressures of 80 inches and above are used as initial ones, we believe the lamps are governed down to 54 inches—the higher pressure in the mains being to ensure that the lamps, whatever their situation and distance from the compressor-station, get equality of pressure at the burner. The size of the mantle, too, he points out, is found to be of importance; and particulars are to be obtained from the paper. Greater attention is now being paid to mantles for high-pressure work; and we know that trial is proceeding with various kinds in several places. As Mr. Grafton observes, what is wanted of a mantle, is the best candle-power-life; and various factors enter into the procuring of this. It is noticed that the author remarks, without qualification, that a yellow light penetrates fog better than a white light. This depends on the nature of the source of the light. What are known as the yellow flame arc lamps have a wonderfully far-away, concentrated appearance in a dense fog, though one may be standing in close proximity to the lamp column. There will be sympathy with Mr. Grafton's contention that costs for globes and mantles should be given at per burner instead of at per lamp; seeing that otherwise the large power multiple-burner lamps suffer in comparison with single burner ones. There is one table included in the paper that experience in other quarters will suggest contains some remarkably high figures. It is the one preceded by the words: "The *actual* cost of globes per annum for a type of lamps having (say) 1500-candle power burners *may be*"—then follow figures which the foregoing wording makes doubtful as to whether they are submitted as "actual" or purely hypothetical. The total costs that the author gives show remarkably good working at Glasgow. In considering them, however, care must be taken to obtain a grasp of the "new basis" which he has adopted as described in a preceding paragraph.

Lighting and Ventilation.

Of all places in the world where lighting and ventilation should be *sans pareil* is the home of the Institution of Electrical Engineers. But it is just the contrary. "Meteor" of the "Electrical Times" long since complained, and told the whole world, without fear, that electrically lighted though it was, "ventilated" though it was by a monster electric-fan, the air of the lecture hall was positively "stagnant" on the occasion of a meeting. Yet electrical engineers talk of how electric lighting maintains the atmosphere beautifully pure, and the electric-fan effectually extracts the organically-laden atmosphere of rooms where people are assembled. If the electrical people cannot properly light and ventilate their own lecture hall, then how are they to do such work for other people? "Meteor" has issued another plea for the revision of the lighting and heating arrangements of the hall. He writes quite candidly. "We have consistently objected to the arrangement, especially the lighting, ever since we first saw it. The ventilation we cannot criticize so much; for there is none. But pending a rearrangement of the lighting scheme, we should like to feel that all future meetings were held *in camerâ*. Frankly, it is not a thing to show to friends or critics. It was probably a well-meaning experiment; and there is much virtue in experiments. But the mature verdict of very many people is now that, although the distribution is ideal, and

the reading of small print is quite easy, the effect is shadowless, Morguelike, and calculated to induce the profoundest pessimism. Artificial lighting has other functions than that of merely enabling people to see clearly. . . . Light should exhilarate, and it should stimulate imagination." This is that marvellous indirect lighting that was, at any cost, to protect the men of the electrical industry from eye-injuring glare, from which there is less concern to protect the eyes of other people.

Nitrate from the Atmosphere.

In one part of the recent Presidential Address of Mr. W. Duddell, F.R.S., to the Institution of Electrical Engineers, there was reference to a subject in which the gas industry as the producer of one of the world's fertilizers is concerned. Mr. Duddell spoke of the great commercial value of the oxides of nitrogen; and he thinks it probable that their production by electrical means will be one of the most important industrial applications of electricity. Already in Norway between 100,000 KW. and 120,000 KW. are employed working day and night for this purpose; and it is stated that this power will shortly be increased to nearly 250,000 KW. Although much work has been done on the subject of the nature of the discharge which produces the greatest proportion of oxidized nitrogen, yet Mr. Duddell feels that the last word on this subject has by no means been said, and possibly a simple observation of some peculiarity of the electrical discharge may form the key to greatly improving the efficiency. Should this be the case, a large nitrate-producing industry may grow up around the home coal-fields. Last year about 125,000 tons of nitrate were imported into this country. To produce the equivalent amount of fixed nitrogen per annum would, on the basis of Norwegian plants, require about 150,000 KW. At the moment, the cost of electrical power is the chief stumbling-block to the introduction of the manufacture on a large scale in this country.

The Supply of Electric Power to Gas-Works.

Last week's "Electrician" says: It is not often we are in agreement with our friend "Electricity Supply Memoranda" of the "JOURNAL OF GAS LIGHTING;" so that we hasten more readily to chronicle the fact. Our contemporary points out that the Canterbury Corporation Electricity Department has fixed a charge of 4½d. per unit for energy supplied for power purposes to the gas-works. The usual rate, by the way, is 1½d. So that there can be no doubt that such a charge is too high; and it looks as if our contemporary's contention that it has been especially designed to meet a particular case is a correct one. We cannot imagine any supply department in these enlightened days charging such a price for what we suppose is a practically continuous power load. Whatever be the explanation, the policy is a wrong one—worse than that, it is a shortsighted one. Not even an electricity department should be averse to making a profit out of its competitors. But, on the other hand, it is preferable to do this in as fair a way as possible. Further, it is as well to remember how a policy such as this looks to other unbiased consumers. It is the sort of thing that occasions the remark: "Well, if they're doing this to the gas department to-day, they'll be doing the same thing to us to-morrow;" and in the subsequent fright a consumer is lost to the department. We therefore hope that electricity departments generally will not adopt this policy of discriminating against gas undertakings as power users. Surely electricity for all purposes is to make such undesirable methods as these also unnecessary. Further, gas-works as a load on electricity supply mains are a facter not to be neglected, as witness the description of the Leipzig plant in the current issue of our contemporary.

Manchester University Lectures.—We learn from Mr. J. Alsop, the Secretary of the Manchester and District Junior Gas Association, that the second of the series of lectures arranged to be given in the Manchester University will be delivered next Saturday afternoon by Mr. Franklin Thorp, whose subject will be "The Mixing of Gas and Air for Lighting and Heating. Mr. T. Duxbury, of Oldham, will preside. After tea, there will be a discussion on "Incandescent Lighting."

Methods of Economizing Heat.—At the Royal Society of Arts last night, Mr. Charles R. Darling, F.I.C., delivered the first of three Cantor Lectures on this subject. He indicated the sources of heat, and then discussed the possibility of utilizing solar heat and tidal energy. He next mentioned the various solid, liquid, and gaseous fuels, and dealt with their economic combustion in furnaces, the combustion of gases in a porous diaphragm, and the utilization of waste heat. Next Monday, he will discourse on the disposal of heat in various types of engine; and on the 16th inst. he will take up the subject of domestic heating, which is of special interest to our readers.

ELECTRICITY SUPPLY MEMORANDA.

A Technically Stimulating Presidential Address — The Limiting Power of Materials—Substitution of Gas for Solid Bodies in Electric Lighting—Coloured Flame Arcs—A Queer Comparison from Ross—Electrical Inconveniences—The Death Roll—Creeping Extensions at Hastings.

IN his Presidential Address to the Institution of Electrical Engineers, Mr. W. Duddell, F.R.S., soared above the topics of the day, and the controversies of the business hour (treatment of which controversies by some of his electrical contemporaries is really only worthy of contempt), and carried his listeners to the beginnings of those as yet trackless ways where men are labouring to achieve fresh progress. His address, as a presidential deliverance, was new, refreshing, and instructive. And yet there are some who consider the President ought to have shaped it so that it took less of the form of a direction-post as to possible technical progress, and treated more of the broader commercial policy that the electrical industry is doing its best, with internal heterogeneous parts and opposing forces, to bring into being. But we cannot alter a man's thoughts, brains, and interests (to comply with those of other people) without doing damage to originality. We are not all endowed in the same manner; and a good thing for the world that we are not. And we would not have had Mr. Duddell's address changed in one single phrase to please any of those who talk as though the whole fabric of the electrical industry depends for its stability at the present time upon nothing but the broadening of its commercial foundations. That is the narrow view; and it stands in ill-contrast with the cry for a broader commercial policy. The cry is all right in its time and place; but it ought not to be permitted to rise above all other considerations, and cause neglect of matters that are equally germane to progress. Mr. Duddell warned the Institution not to become too confined in its ideas, and to limit technical considerations too much to any one branch of the electrical industry. The broadest minds will agree with him, and ignore those who are wanting more and more words on such subjects as the trade in lighting, cooking and heating, and power, and how to strangle the commercial enemy. The force to accomplish the strangling part of the business (if the gift that Nature has given of the gaseous means of doing things is ever to be superseded, which we doubt) can only be derived through technical ways and not purely commercial ones. Addresses such as this by Mr. Duddell stimulate men to fresh investigation.

A large part of the address was occupied with telegraphy and telephony. But there was another section which perhaps was not very pleasant hearing to some electricians, because it was so directly truthful. It treated of household appliances. Those who have boastfully decried the household fittings of the gas industry, and lauded the style of the household fittings of the electrical industry, had a sharp thrust from Mr. Duddell when he said that the designs of electric fittings are still largely reminiscent of gas and candles. To which he added that the results of the attempt to combine the modern form of illuminant with early artistic designs are not always happy, either from the artistic or practical points of view. We may point out to the President that in artistic fittings we can in the gas industry to-day show the equal of the best electric light fittings. The President, while acknowledging that electrical cooking and heating apparatus has advanced during the last decade, proceeded to point to a difficulty which is not often referred to when comparing electrical heating apparatus with heating by means of flames. That is the difficulty of limiting the temperature rise. For instance, for convenience, to boil a kettle it is necessary to be able to generate heat very quickly for a short time. It is quite easy to construct electrical apparatus to fulfil this condition; but if such electrical apparatus be left in service continuously, it may attain a temperature which will be injurious to it. This is not the case with flame temperature, as there is always an upper limit of temperature—viz., that set by the flame itself. If, remarked the President on this point, materials could be obtained for electrical heating apparatus which could be run continuously at a very high temperature—say, in the neighbourhood of white heat—then this difficulty would be, to a large extent, overcome, because the dissipation of energy by radiation would rapidly become so great with rise of temperature that the final temperature would be reached before the heating arrangement was injured. A material with a very high positive temperature co-efficient would serve the same purpose. The President also points out that a further advantage of possible high temperature of the heating part is that it enables heat to be transferred from one place to another by radiation—"a method of transferring heat which we know from experience is very suitable for many heating and cooking purposes." The President probably knows more about such subjects as heat radiation, and its superiority as a method of heating from the health-giving point of view, than many of his electrical contemporaries who are less richly endowed mentally. He adds: "We are all accustomed to the advantages of the glowing red fire," which is not a description that can be applied to the electrical radiator.

Illustration is given by the President as to the wastefulness of the system of electrical production onwards to electrical utilization. Take this as an example. Something like 500 million units of electricity are employed annually for lighting purposes; and even with the best forms of modern metallic filament lamps, the

efficiency of the conversion of electrical energy into radiation of a wave-length suitable to our eyes probably does not exceed 5 per cent. If, moreover, consideration is given to the losses in the boilers and engines, so as to find the overall efficiency of the electrical means of production of light, it is realized that the figure is well under 1 per cent. Truly, as the President observes, there is plenty of room for improvement here. Mr. Duddell examines this matter of the relation between radiation and the useful light given by incandescent electric lamps. In, he tells us, the incandescent lamp, there is probably very little loss by conduction and convection. Practically the whole of the electrical energy is converted into radiant energy; yet, unfortunately, over 90 per cent. of this energy is produced at wave-lengths which are too long to affect our eyes. The wave-length at which the hot filament gives out the bulk of its energy can be shortened by raising its temperature. But there is a limit to this in the temperature which the filament will stand. Probably the main reason that the metal filament lamp is more efficient than the carbon filament lamp is that its filament is capable of being used at a much higher temperature. This, however, need not be the sole reason, as there are some bodies which tend to concentrate their radiation in certain regions of the spectrum. The processes that are taking place in a solid body when it is radiating have not been fully elucidated.

For the higher power lamps, from which direction is progress to be? Is it to be by the substitution of a gas for a solid body as the light-giving agent? The President does not predict; he only tells of accomplishments so far. In the case of the flame arc, advantage is already being taken of the light-emitting properties of heated gas. In the mercury arc, there is another case of the production of light other than by the heating of solid bodies. In both these cases, the high efficiency is probably due to the substitution of a gas for a solid body as the light-giving agent. But, as the President points out, the mercury arc gives a somewhat unpleasant light, owing to the greater part of its radiation being concentrated in a limited number of wave-lengths mostly in the green. The advent of fused quartz (which will stand a very high temperature) as tubes for mercury arcs, has enabled the feeble radiation of the red to be somewhat improved. Up to the present mercury is the only metal that has been used in practice. Other metals have been proposed, and lately it has been suggested to use molten cadmium, which gives a very much more pleasant light. But this metal is a solid at ordinary temperatures; and this necessitates somewhat special starting devices. A minute trace of mercury is said to greatly improve the efficiency; and according to one authority, an efficiency of 6 Hefner candles per watt has been obtained. Although slow, some progress is being made in electric lighting by means of the passage of electricity through gases. The President reminded the members of the vacuum tube 176 feet long which was used to light the courtyard of the Savoy Hotel. This tube, he believed, contained nitrogen; and according to the tests of Professor Fleming it gave an efficiency of 0·56 candle per watt. About a year ago the President saw a tube—not such a long tube—filled with the rare Neon gas obtained from the residues in the manufacture of liquid air. This tube gave a most beautiful rose-coloured light. If this rare gas were obtainable in sufficient quantities, it might be a rival to the flame arc. In passing, he mentioned that tubes containing Neon are now commercially obtainable and are claimed, in the larger sizes, to have an efficiency as high as 2 candle power per watt. To sum up, the President believes that further researches on the borderland between electricity and radiation will no doubt provide still more efficient sources of electric light. But to a practical man, the outlook does not at the moment appear particularly promising.

One of the disadvantages of the yellow flame arc lamp is the colour. Shopkeepers who desire that the colour of their goods shall, after dusk, appear to the prospective buyer as near as possible natural, do not like the light of the yellow flame arc lamp now that the novelty has worn off, to say nothing of the unsteadiness of the light. There seems to be a little notion now in a few electrical minds, that a variety of colour would be an advantage. At the "Daily Chronicle" office in Fleet Street, for instance, some new electric lamps have been erected which make the face of the healthiest passer-by look as though he was making rapid strides to the next world. The light would be an excellent one for stage-effect when the representatives of "ghosts of defunct bodies" are endeavouring to make one's blood curdle. Now an idea has been imported from America, which shopkeepers will not welcome who do not want the colours of their goods visually destroyed by the sources of artificial lights. The idea appears to have originated at the Boston Electric Show, where a length of 3000 feet of street was illuminated by pink and green coloured flame arc lamps—the colours being obtained by impregnating the carbons with colouring material. These lamps, it is said, proved to be an effective substitute for strings of coloured incandescent lamps. The effectiveness may be questioned. Festooned coloured incandescent lamps make a pretty form of decorative illumination, appealing to the eye, without casting an unnatural colour upon everything in the vicinity. It is altogether different with a flame arc lamp, which changes the appearance of things with an impudence that people are beginning to refuse to tolerate. It is suggested that the pink and green flame arc lamps might well be employed this coming Christmas in trading areas. "The season's shopping," the "Electrician" says, "would be made delightfully kaleidoscopic." It would.

The "Electrical Times" highly commends a leaflet issued by Mr. Charles E. Gray, of the Ross Electric Light and Power Company. Our contemporary says that "if the leaflet does not convince some of those residents of Ross who are still sceptical, we shall be surprised." If any of the residents of Ross see our contemporary they may be surprised at the obtuseness of the writer responsible for those words. Let us see what, according to our contemporary, Mr. Gray tells the people of Ross. The expensive old 16-candle power carbon filament lamp consumed a pennyworth of electricity in 2½ hours; the metallic filament lamp will give an *equal* candle power for 8½ hours for the same sum. "Compare this with gas. A flat-flame burner yielding 16-candle power, gives but 4½ hours' lighting for a penny (at the price of gas in Ross). But the flat-flame burner, like the carbon filament lamp, is rapidly departing from us, so Mr. Gray makes a further comparison with the inverted gas-mantle, using 3 feet of gas per hour, or giving seven hours for one penny. Thus the metal filament lamp saves 20 per cent." It is difficult to see what Mr. Gray is driving at, if he is properly represented here; and, if properly represented, it is difficult to understand why "Meteor" or one of the other members of the technical staff of the "Electrical Times" did not correct Mr. Gray. If 3 cubic feet of gas used with an inverted gas mantle gave only 16 candles, it would be developing the extraordinarily poor duty of 5·33 candles per cubic foot. As a matter of fact, 3 cubic feet of gas consumed in one hour in an inverted gas-burner will give a light of 60 candles. Which then would any sensible consumer of Ross prefer—a light of 16 candles for 8½ hours, or a light of 60 candles for 7 hours? From the figures in the leaflet it seems that 21 cubic feet of gas are obtainable for 1d. in Ross. A bijou gas-burner using 1 cubic foot of gas will give a light of 20 candles; so that if the Ross consumer requires a small light, he has the choice of a 16-candle metallic filament lamp for 8½ hours for 1d., or a 20-candle power bijou light for 21 hours for 1d. What have Mr. Gray and the "Electrical Times" to say to the deception of the leaflet, if we have before us the facts as presented in it? If we have not, our contemporary must take the blame.

In the "JOURNAL" a fortnight ago, reference was made (p. 572) to the failure of the electric light at the Whitehall Club on the occasion of a house dinner, at which the President of the Civils (Mr. R. Elliott-Cooper) was the principal guest. The entrance hall, in the absence of the ordinary illuminating agent, was lighted by a solitary candle. After a wait of twenty minutes the light was restored to all the floors, except the entrance one, which was "lighted" all the evening by candles. The "Electrical Times" does not describe the unfortunate occurrence, but dismisses it with the words that "the illumination scheme on the ground floor attracted much attention; it showed a marked divergence from the conventional arrangements so much in vogue at Coronation time." Mr. Seabrook touched upon the question of sudden electrical difficulties in one of his homilies to young men at the East London College. He pointed out the importance of an electricity undertaking having a "polite" staff of meter readers, and "the emergency staff should consist of well-paid, sedate men, able to do temporary repairs with despatch in the presence of *irate* consumers." The men ought to be well paid and sedate, as the irate consumer's language might be intolerable unless the salary paid was adequate to cover compensation for having to endure that sort of thing, and the quality of sedateness is necessary in order that there may not be reprisals.

Further extensions of the roll of electrical fatalities. Edwin Howgate, only 17 years of age, was, on the 15th ult., found dead in a cellar in the "Fox and Grapes" yard at Kirkgate, Leeds. The evidence proved that he died from electric shock. It was found that the coils of an electric motor in the cellar were completely burnt out. The cellar had been flooded a few days before; and the coils had been soaked through. The coils became electrically connected with the motor frame; and it was evident that, as soon as the current was put on, the coils burnt up. The same day a young fellow (aged 18), named Frederick Rigby was found dead at the works of Alfred Hickman, Limited. The evidence of an electric crane driver showed that the youth had been working on an electric controller for some months. On the night of the occurrence, the driver went to ask deceased a question, and found him leaning on the controller. The current was at once switched off; and deceased fell to the ground—dead. There was a burn on the youth's left forearm.

The creeping extensions policy continues in the Electricity Department at Hastings. The plan is for the department to get two or three applications from a road; and then recommend the laying of the necessary cable at the cost of a few hundred pounds. Accompanying the recommendation is an estimate of what is likely to be the income from the private consumers in the road. To put as good a face as possible on the financial side of the proposal, it is recommended that the gas-lamps be converted to electricity (producing discontent with the lighting); the profit on this being, by some occult means, calculated at the high figure of 30s. per annum. The total income is sufficient for interest and sinking fund on the capital expenditure on the cable. Nothing is said about depreciation and other matters, but there is a little balance left, under this beautifully simple piece of arithmetic, to pay for the current supplied and some of the other expenses incidental to the running of the electric lamps for a twelvemonth. Nobody seems to care a straw how the Electrical Engineer arrives at his figures, nor to ascertain whether these successive little flights are really profitable. And this passes at Hastings for local administration! With the strain on his nerves that such calculations

occasion him, small wonder that the Borough Electrical Engineer requires a technical assistant, though if it is true what one of the councillors says this technical assistant is to receive less in salary than the non-technically trained foreman. The idiosyncrasies of electrical management are many.

OBITUARY.

We learn, with much regret, of the death on the 18th ult. of Dr. M. W. STEUDE, who had for over twenty years been on the editorial staff of the "Journal für Gasbeleuchtung," in a capacity corresponding with that of Sub-editor in English offices. Dr. Steude was born at Cassel in 1864, and studied chemistry, physics, and political economy at Heidelberg, and the technology of fuel and gas at Carlsruhe. In recent years, Dr. Steude had suffered much from illness and domestic affliction; but he seldom missed attendance at the annual general meetings of the German Association of Gas and Water Engineers, to the members of which he was well known for his geniality and assiduity. He was present at the meeting in Munich in June last. The "Journal für Gasbeleuchtung" speaks of him as one whose loss it will be very difficult to replace.

PERSONAL.

Mr. J. G. STEWART, of Stewarts and Lloyds, Limited, has been elected Provost of Dunblane.

Mr. A. S. BROOK, Manager of the Chard Corporation Gas-Works, has been appointed Manager of the Lisburn Gas-Works; and his resignation of the position at Chard was accepted by the Corporation last week.

Mr. HEDLEY HOY, of Lancaster, has been appointed Gas and Water Manager to the Tyldesley Urban District Council, in succession to Mr. Williams, who, as reported in the "JOURNAL," has taken up duty with the Altrincham Gas Company.

Mr. WILLIAM ARNOTT, the Manager of the South African Lighting Association at Port Elizabeth and Grahamstown, who has been home on an extended leave, returns to South Africa by the "Saxon"—this week's mail-boat. He reports feeling much better in every way for his holiday.

It has already been announced in the "JOURNAL" that Sir Edward Fraser, of Nottingham, has resigned the chairmanship of the Derwent Valley Water Board. Sir WILLIAM VINCENT, of Leicester, has been appointed to succeed him; Alderman ARNOLD BEMROSE, of Derby, being elected Vice-Chairman.

The officials and workmen employed by the Broadstairs Gas Company recently presented Mr. HERBERT WILLIAM KAYE with a handsome oak timepiece, of Queen Anne design, bearing a suitable inscription, on his leaving the Company's service to take the appointment of Gas Manager at Milton Regis, as reported in the "JOURNAL" last week.

The numerous friends in the gas industry of Mr. JAMES W. HELPS will be pleased to learn that he arrived home from South Africa last Tuesday evening; and they will rejoice with the members of his family, and the Directors and staff of the Croydon Gas Company, at the improved condition of his health. At the same time, his medical adviser has recommended a course of baths at Aix-la-Chapelle. He will be proceeding there to-morrow (Wednesday), and is not likely to return home again until quite the end of the year.

After long and faithful service, over a period of upwards of forty years, Mr. ALEXANDER WALKER, the Manager of the Irvine Gas-Works, will retire at the end of the year; and the Directors have appointed as his successor, out of about fifty applicants, Mr. H. G. RITCHIE, at present Gas Engineer and Manager to the Fraserburgh Corporation. Mr. Ritchie is a native of Kirkcaldy, and received his early education there. His technical education was obtained in the Heriot-Watt College, Edinburgh, where he was College Medallist in the "Gas Manufacture" classes. He also holds a first-class certificate (Honours Grade) of the City and Guilds of London Institute in "Gas Manufacture;" and he has first-class certificates for chemistry, building construction, and drawing. He was trained in practical work in the Kirkcaldy Gas-Works for thirteen years, and for four years he was Chief Assistant there. Four years ago he was appointed Manager of the Fraserburgh Gas-Works, and has carried out there many structural alterations and improvements to his own plans and specifications. Under his supervision, the Fraserburgh works have made great headway.

Illuminating Engineering Society for Germany.—It appears from an announcement in the "Zeitschrift für Beleuchtungswesen" that an Illuminating Engineering Society has been formed in Germany, as the result of the efforts of the Reichsanstalt. A Provisional Committee has been nominated, with Professor Warburg and Dr. E. Liebenthal as Chairman and Secretary; Dr. Bunte, representing the German Association of Gas and Water Engineers, and Herr Dettmar, on behalf of the electro-technical organization, rendering assistance. The first ordinary meeting is to be held in February next, when it is expected that Professor Otto Lummer will deliver an address.

THE LAST GAS EXAMINATIONS.

Report of the City and Guilds of London Institute.

WE have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the report on the work of the department during last session. We extract some particulars as to the examinations in "Gas Engineering" and "Gas Supply."

As showing the extent of the work of the department, it may be mentioned that at the recent general examination in technology 22,111 candidates were presented from 447 centres in the United Kingdom; and 13,886 of them passed. By including the candidates from India, from the Overseas Dominions, and from other parts of the British Empire, those for the special examinations in magnetism, electricity, and cookery, and those for the teachers' certificates in manual training and domestic subjects, the total number of examinees was 25,517. As readers may remember, in order to secure the expert advice of trade societies and professional bodies in the conduct of the department's educational work, the Institute have arranged for the formation of several Advisory Committees, consisting of persons interested in different trades and industries. The Council of the Institution of Gas Engineers act as an Advisory Committee in the subjects of "Gas Engineering" and "Gas Supply." By the aid of these Committees, the Institute are enabled to promote useful relations between trade organizations and the schools in which artisans and others receive technical instruction.

Coming to the general work of the department, we find that the number of subjects in which examinations were held last session was 75—the same as before; and the number of separate classes was 4552, against 4495—the former figure being the highest on record. The number of students in attendance was 53,999, compared with 52,680. In the subjects of "Gas Engineering" and "Gas Supply," the number of students dropped from 980 to 802; and that of the candidates from 699 to 667. The report stated that the candidates in the former subject showed some improvement, "particularly in the quality of the drawings and sketches submitted for Grade I." The best papers for the final examination were of "a high order of merit." In "Gas Supply" also, we find that "the candidates acquitted themselves well."

Turning to the tables which give the results in the separate subjects, the report shows that in the two relating to gas there were 26 centres, with (as already mentioned) 802 students in attendance. The candidates numbered 260 in "Gas Engineering," and 407 in "Gas Supply," compared with 271 and 428 before. In the Final Grade, in the former subject, 39 passed in the first class, 30 in the second class, and 22 failed; while in the grade next below the passes were 45 and 69 respectively, and the failures 55. There were thus 183 passes and 77 failures, or 29·6 per cent. In the Final Grade in "Gas Supply," 39 candidates passed in the first class, 43 in the second, and 30 failed; while in Grade I., 122 passed in the first class, 110 in the second, and 63 failed. There were thus 314 passes and 93 failures, or 22·8 per cent.

Of the total number of students in the two subjects, one passed at the Battersea Polytechnic in "Gas Supply" in the grade next below the Final. At the Goldsmiths' College, out of 12 students in attendance, 7 were examined and passed in this subject—2 in the Final Grade, and 5 in the one next below. At the Northern Polytechnic, one candidate was examined in "Gas Engineering," and he passed in the Final Grade. From the classes at the Regent Street Polytechnic, 24 students out of 35 were examined in "Gas Engineering," and 22 passed—13 in the Final Grade, and 9 in the grade next below it. From the various schools of the London County Council, out of 264 students in attendance at classes for the two subjects, 121 were examined in "Gas Supply," and 96 passed—19 in the Final Grade, and 77 in Grade I., and one was a prize winner. In "Gas Engineering," two were examined, and both passed in the lower grade. One candidate was examined in "Gas Engineering" at a centre in New South Wales, and he passed in the lower grade.

Reporting on the work of the students in "Gas Engineering," the Examiner (Mr. Thomas Glover) says:

> It is gratifying to record an improvement in the quality of the drawings and sketches, particularly in the Grade I. Examination. In a few cases the quality of the work done was of exceptional merit; but in many cases there is still room for improvement in showing more careful observation and the power to express ideas in neat and accurate sketches. Chemical tests were described, generally, with care and exactness; but many candidates in Grade I. failed to show how a mouthpiece could be attached to a retort, or the provision in the thickened end of the retort for screwing on the nuts of the retort bolts. Few candidates in the Grade I. Examination attempted to draw a section of a valve; but of the few who made the attempt several produced good drawings. Some misconception seems to exist as to the percentage of carbon dioxide usually found in water gas, and as to the strength of liquor produced in the hydraulic mains.
>
> In the Final Examination, there were quite satisfactory answers to the question dealing with the use of concrete for retort-bench foundations; and only a few cases where the use and value of reinforcement were not understood. The composition and use of various forms of refractory material seem to have been well taught; but the objection to the use of silica for water-gas generator linings does not appear to be known to many students.
>
> The Burkheiser process was well described by a few students; and

the coal-liming process, as applied at Cheltenham, by a larger number. It appeared somewhat strange that the main feature of the latter process—viz., the reduction of sulphur compounds in the gas—was overlooked, and only the collateral advantages were named by a number of candidates.

In the Final Examination, the drawings and sketches of a coal elevator and of a section of a concrete gasholder tank were, with a few exceptions, not equal to what might be expected from students of this branch of engineering; and attention is again directed to the importance of drawing and mechanical engineering as a necessary part of the training of those who wish to equip themselves for responsible positions in gas-works. Teachers might assist in this matter by providing, for the use of their classes, large-scale drawings and models of plant and apparatus, and by insisting on students making copies in class and afterwards developing these into fair copies for home work.

The examination of the answers leaves the impression that, for the most part, students of gas engineering are thoroughly up-to-date, and are keen to understand the latest developments and practice. In the Final Examination, the best papers were of a high order of merit; and the Examiner regrets there is only one prize to award.

Mr. Walter Hole, the Examiner in "Gas Supply," reports as follows:

Notwithstanding the high standard adopted, the candidates have, on the whole, acquitted themselves well, and give evidence of careful preparation. Particularly is this the case in Grade I., the candidates for which have acquitted themselves better than those in the Final Examination. This is clearly shown in the higher percentage of passes, and also greater proportion of first classes obtained. In the Final Examination, the chief weakness was revealed in the replies to question No. 8; the widely differing solutions of the problem set showing that many of the candidates had but a very imperfect grasp of the principles underlying good street lighting practice.

In Grade I., curiously enough, weakness was shown in the purely practical question No. 2. A large number of the students had not realized that the use of the Ruscoe split-tee quite obviates any interruption of supply, bagging-off of the main, or provision of bye-pass, or even understood the manner of attaching these to a trunk main. Notwithstanding these and other lesser deficiencies, however, on the whole, the candidates have done well.

The questions set in "Gas Engineering" were given in the "JOURNAL" for April 30 (p. 311), and those in "Gas Supply" in the next issue (p. 386). The following are the two questions referred to by Mr. Hole:

8. The subjoined plan shows a portion of a principal thoroughfare in a large town. The street is 70 to 75 feet wide from building-line to building-line, and the footpaths on each side are 12 feet wide. Large shops abut upon the street on both sides. A passenger refuge is marked A on the plan. You are required to light this thoroughfare with high-pressure gas-lamps. Mark on the plan where you would place the lamps, and state: (*a*) The candle power of the lamp you would employ. (*b*) The height above ground level at which you would fix the lamps. (*c*) How far apart the lamps should be. (*d*) How you would support the lanterns (*e*) On what basis you have made your calculations.

2. You are required to insert a 12-inch branch in a 24-inch main. State in detail how you would proceed when (*a*) using an ordinary tee, and (*b*) using a Ruscoe split-tee, assuming that the necessary excavation has been made in each case. Which method do you prefer, and why?

The names of the successful candidates in both subjects will be found in the "JOURNAL" for June 18 (p. 890); and those of the prize winners in the issue for Aug. 6 (p. 376).

WORKMEN'S COMPENSATION STATISTICS.

ANOTHER volume of the annual Home Office Blue-Book containing statistics of compensation and of proceedings under the Workmen's Compensation Act, 1906, and the Employers' Liability Act of 1880, which makes its appearance about this time of the year, has lately been published—the period dealt with being 1911. The report bears the signature of Sir Edward Troup, and is divided into two parts. Returns have again been collected from the seven great groups of industries—mines, quarries, railways, factories, harbours and docks, constructional works, and shipping; and it is pointed out that these returns, which are given in Part I., furnish materials for a general review of the working of the Compensation Act of 1906 in relation to the main body of the industries of the United Kingdom. The returns referred to are made by, or on behalf of, employers in pursuance of the Order of the Secretary of State under section 12 of the Act.

In the seven groups of industries referred to, the number of employers included in the returns was 139,884; and the aggregate number of persons employed coming within the provisions of the Act was over 7 millions—more than 5 millions of whom came under the heading of "factories." In the period under review, and in the industries named, compensation was paid in 4021 cases of death and 419,031 cases of disablement; the average payment in case of death being £154, and in case of disablement £5 16s. The annual charge for compensation, taking the seven groups of industries together, averaged 8s. 5d. per person employed. In factories it was 4s. 6d. per person, in quarries 10s. 9d., in constructional work 13s. 5d., and in mines (the highest in the list of industries) 23s. 8d. Attention is, however, drawn to the fact that in the coal-mining industry the charge arising under the Act works out at about 1·1d. only per ton of coal raised. The total amount of compensation paid under the Act in the seven groups of industries during the year was £3,056,404, which compares with £2,700,325 for the preceding twelve months. It is calculated that, when the costs of management, commission, legal and medical expenses, &c., are added, the total charge borne by the seven industries probably amounts to more than £4,000,000. The increase last year in the number of cases compensated was to some considerable extent caused by the Hulton Colliery disaster, which resulted in the loss of 344 lives at the end of 1910—the charge for which was included in 1911; and, besides this, the larger number of accidents was found to correspond with the increased activity of trade. The figures quoted include, in addition to accidents, cases of the twenty-four industrial diseases that are included under the Workmen's Compensation Act. In the seven groups of industries, compensation was paid in 33 cases of death from disease, and in 5737 cases of disablement. No less than 87·6 per cent. of the total number occurred in connection with the mining industry; while of the remainder, 554 were cases of lead poisoning. The figures given in the return, of course, refer only to compensation paid under the 1906 Act, and do not include any amounts paid under contracting-out schemes, payments made in cases still outstanding under the earlier Acts, damages under the Employers' Liability Act, or costs incurred in legal proceedings.

Figures in detail for each of the seven industries are given in the return. The total number of factories on the register of the Factory Department of the Home Office at the end of 1911 was 114,442; and in addition there were 6207 factories closed in the course of the year, for which returns were also due. Returns were received in respect of approximately 115,200 occupiers of factories; and inquiries made in a number of cases in which returns were not received showed that they were mostly small works with few (if any) accidents. It appears that for accidents compensation was paid in 999 fatal cases to the amount of £137,479, and in 175,496 disablement cases to the amount of £1,021,999. In 570 of the fatal cases, compensation was paid to persons wholly dependent, the amount averaging £204; and in 313 cases to persons partially dependent, the amount averaging £63 7s. In the disablement cases, the compensation paid averaged £5 16s. a case. For industrial diseases, the returns show that compensation was paid in 28 fatal cases, to the amount of £3862; and in 671 disablement cases, to the amount of £13,889. In 21 of the fatal cases, persons were left wholly dependent; the compensation averaging £164. In the disablement cases, the compensation paid averaged £20. The total charge for compensation under the heading of factories was £1,177,229; and the total number of persons employed who were covered by the returns was close upon 5¼ millions. The charge of 4s. 6d. per head for compensation last year compares with 4s. 3d. in 1910.

With regard to mines, returns were received in respect of 2382 employers; the instances in which there were no returns relating to small mines, in which few (if any) accidents occurred during the year. As to accidents, compensation was paid in 1711 fatal cases, to the amount of £281,183; and in 178,466 disablement cases, to the extent of £905,999. In 978 fatal cases, compensation was paid to persons wholly dependent, the amount averaging £241; and in 590 cases, to persons partially dependent, the amount averaging £76. In the cases of disablement, the compensation paid averaged £5 1s. In respect to industrial disease, compensation was paid to the extent of £68,041. Thus the total charge under the Act on the mining industry was £1,255,223. The approximate average number of persons employed to whom the Act applied, as given in the returns, was 1,059,642. The charge of £1 3s. 8d. per head for compensation last year compares with £1 0s. 2d. in 1910; while the charge on coal-producing mines of nearly 1·1d. per ton of mineral raised compares with 0·9d. in the previous year. The number of fatal accidents reported under the Mines Acts in 1911 was 1308; but the difference between this figure and the number of fatal cases in which compensation was paid is mainly due to the Hulton Colliery explosion at the end of December, 1910. This, as already mentioned, resulted in the loss of 344 lives, the compensation in respect of which was not paid until 1911.

Under the heading of quarries, it is mentioned that returns were received in respect of 5859 employers. Compensation was paid in 83 fatal accident cases, to the amount of £11,177; and in 5817 disablement cases, to the amount of £38,274. In 56 fatal cases, compensation was paid to persons wholly dependent, the amount averaging £177; and in 16 cases, to persons partially dependent, the amount averaging £73. In the disablement cases, the compensation paid averaged £6 12s. per case. As compensation to the amount of £149 was also paid in respect of industrial disease, the total charge on the industry was £49,600. The approximate average number of persons employed was 91,957; so that the compensation paid works out at an average of 10s. 9d. per head, which compares with 10s. 3d. in 1910.

As to constructional work, the order of the Secretary of State requires returns to be made in respect of the construction of railways, tramways, canals, harbours or docks, bridges, tunnels, water-works, sewers, roads, and other works of engineering. The construction of buildings (except when forming part of an engineering work) was excluded. The real intention was to cover as nearly as possible the large body of men engaged on what are known as "engineering works;" but neither the number of employers nor the number of workmen employed in this industry is clearly known. Returns were received in respect of 3597 employers. Compensation was paid in regard to 102 fatal accident cases, to the amount of £14,638; and in 6707 disablement cases, to the amount of £52,362. In 62 fatal cases,

compensation was paid to persons wholly dependent, the amount averaging £210; and in 16 cases to persons partially dependent, the amount averaging £87 5s. In the disablement cases, the compensation averaged £7 16s. Compensation was paid to the amount of £107 in respect of industrial disease; and the total charge therefore for compensation was £67,107. The approximate average number of persons employed was 99,889; and the charge of 13s. 5d. per head for compensation compares with 12s. 10d. in 1910.

With regard to the duration of compensation for accidents, there is a table which shows that cases lasting two weeks and less than three weeks accounted for 32·06 per cent. of the total number; and cases lasting four weeks and less than thirteen weeks, for 34·46 per cent.

THE NEW COALITE PROCESS.

More Rational Views.

THE coalite process is now in the hands of the Eticoal Syndicate, Limited; and a more rational view is being taken of the process and of its capabilities. Had the present attitude been adopted at the outset, there would not have been that acute criticism, technical and financial, that assailed the process when it was first being exploited, with on every hand obvious exaggeration. A pamphlet of 26 pages has been issued by the Syndicate setting forth the present position of the process; and, while in it a rosy view may be taken as to its possible profit-producing capabilities, the extraordinary flights of imagination that were indulged in by the exploiters of the system in its old form are carefully avoided by those who are yet stubbornly hoping to make a financial success of the system. In the very opening of the pamphlet, it is admitted that the severe criticism that the old process met with from the technical press and experts was deserved.

In working the original process, an extreme in low temperature was adopted; and "while a fuel was produced which was ideal for the uses for which it was designed, it was too friable to handle in transportation, and certain of the bye-products were of a character unsaleable in the markets for which they were designed." In looking into the causes of failure, the present management came to the conclusion that there was a mean of temperature between the high temperature of the coke-oven process and the low temperature of the coalite process, whereby the same practical results could be arrived at so far as the fuel was concerned, and at the same time a product be realized which could be handled commercially. Working to this theory, "the process has been so altered as to produce a fuel which is smokeless, free burning, and yet hard enough to withstand transportation over long distances. At the same time, the yield of sulphate of ammonia has been brought up to about the quantities produced under other processes, while the tar in quantity about doubles that of the other systems of carbonization."

Under the old process, a ton of coal produced:

Coalite . .	1450 lbs.—65 per cent.*	
Tar . . .	22 gallons, sp.gr. 1·030.	
Sulphate .	12 lbs.	
Gas . . .	3500–4000 cub. ft.	22 c.p. 750–850 B.Th.U.

* Owing to the friable nature of the coalite, only about 60 per cent. of this was marketable.

Under the new process, a ton of coal produces:

Coalite . .	1450 lbs.—65 per cent., all of which is marketable.	
Tar . . .	18 gallons, sp.gr. 1·080.	
Sulphate .	28 lbs.	
Gas . . .	8500 cub. ft.	17 to 20 c.p. 700 to 750 B.Th.U.

It is admitted that while the gas is much smaller in volume than that produced by the two other systems, and while it is quite evident that, as a process, it can never compete with the gas companies in its economic use as an illuminant, yet as a power producer it will equal the energy value of the coke-oven process; for while its volume is somewhat less, its high calorific value allows mixing with producer gas—the combination equalling the value of the coke-oven gases. It is not now claimed for the coalite process that it will supersede in any way the two older methods; each has its uses and advantages peculiar to its local conditions. The process has a distinct field of its own—viz., the production from smoke-producing coals of a product ideal for domestic consumption—smokeless, easy of ignition, and giving forth almost its entire theoretical value in radiant heat. That is what is now claimed; and the Syndicate put coalite forward solely as a competitor with coal for domestic use. At the same time gas undertakings must regard it, if (the "if" may be accentuated) it should ever come extensively on the market, as a commercial competitor with their own coke.

In the new process, the coal is subject to carbonization in the small vertical retorts for a period varying from six to eight hours, during which time it is subjected uniformly to a low heat, which affects the coal slowly to begin with, but ultimately towards the end of the carbonizing period the process of heating is greatly accelerated for about half-an-hour and then the charge is allowed to fall into a dry quenching chamber. The system through which the gas passes to the holder is much the same as in ordinary gas-works practice, excepting that the gas passes through sulphuric acid saturators for the formation of sulphate of ammonia, and thence through a condenser and benzol-recovery plant to the purifiers and gasholder. Approximately 60 per cent. of the gas reaching the holder is returned to the battery for the purpose of heating-up the retorts; the balance being used under the boilers or in the gas-engines for power. The method of heating the retorts is accomplished by fire-clay burners into which are fitted six small nozzles or jets. The burners are situated between the retorts close to the bottom, and extend the full width of the combustion chambers. A feature of the heating chamber is that no part of the retort is subjected to the direct action of the flames during combustion, as they impinge themselves against the baffle-bricks in their upward passage; and in this way it is reasonable to claim that the life of the retorts is greatly prolonged.

The following is given as a typical analysis of coalite gas, comparing it with town gas:

	Coalite Gas.	Town Gas.
Candle power	17–20	16-17
Calorific value, B.Th.U. gross.	700–750	550–600
Hydrocarbons (unsaturated) .	4-5 p. c.	3'5-4 p. c.
Hydrocarbons (saturated) . .	43-46 „	37-39 „
Hydrogen	41-48 „	48–50 „
Carbon monoxide	6·8 „	6-7 „
Nitrogen	0'5–1'5„	1'5-2 „
Carbon dioxide	0'5–1 „	2-5 „

As to the coalite, in comparison with coal, it is about twice as bulky—that is to say, it requires a space of, approximately, 90 cubic feet per ton. Exhaustive tests, it is stated, have been carried out from time to time which show that coalite has a heating value of 13,500 B.Th.U. per lb., while bituminous coal—such as is used for domestic heating—gives on an average 14,800 B.Th.U.

The following are results of chemical analyses of coal, coalite, and coke:—

	Coal. Per Cent.	Coalite. Per Cent.	Coke. Per Cent.
Fixed carbon.	59-60	80–82	89·91
Volatile hydrocarbons .	29-30	8-9	1-1'5
Water	4-6	—	—
Ash	5-6	7·9	8–12

Later on in the pamphlet we find this submitted: The tar made by the coalite process, containing as it does only traces of free carbon and being of a low specific gravity, is much more easily distilled than that from gas-works or coke-ovens. [The Syndicate must not overlook the changed character of gas-works tar under the new systems of carbonization.] Provided the tar is fairly free from water, the charge will stand firing straight away, which means a saving of about three hours on a 10-ton charge, less fuel is required, and as there is practically no deposit in the stills, mechanical agitators are not necessary and the life of the still is prolonged. The usual method is to separate the ammoniacal liquor (about 4 per cent. by dehydration) and pump the warm tar to ordinary dish-bottomed stills, of 10 to 20 tons capacity, set in ordinary Cornish settings, and fired by breeze or surplus gas. The fractions will vary to suit local requirements; but the usual points here are up to 170° C., from 170° to 235°, 235° to 270°, 270° to the finish, which is determined by the grade of pitch which is being aimed at, and will be from 310° to 320° C. As a larger percentage of light oils is obtained, there must be coils of ample length (say) 250 ft. 4 in. for a 10-ton still and a good water supply. As there is no naphthalene or anthracene obtained, a steam supply to the condenser is not required. Two galvanized receivers, large enough to contain a complete fraction, should be provided for each still, which allows the quantities from each charge to be measured before running to the storage tanks. The chemical treatment is the same as in ordinary tar; but care must be taken with the soda-washing, owing to the large percentage of tar acids. The first three fractions can be either treated separately or mixed, re-run, and then washed. It is an advantage to store them separately in the first instance, however, as a charge of any grade is always at hand. Provided the crude tar is made at the proper temperature, of a specific gravity not below 1·080, the usual spirits are obtained by fractionation, and are useful as motor and cleansing spirit, rubber solvents, turpentine substitutes, &c.

Regarding benzol recovery from the coalite gas, where the illuminating value of the gas need not be taken into account, from 1½ to 2 gallons of benzol per ton of coal carbonized can be recovered. This is extracted by washing the gas with heavy oil either in a pair of tower scrubbers or in a rotary washer. If the latter is being used, care has to be taken to have the brushes revolving very slowly, as a rapid churning of the washing oil tends to liberate the benzol at the scrubber outlet. The oil is obtained from Nos. 3 and 4 fractions of the crude tar distillation; and on testing should show no distillate to 220° C., and not over 10 per cent. residue at 310° C. With proper care as to regular feed and temperature (which should be kept near 15° C., or even under if possible), the washing oil will carry 8 to 10 per cent. of its weight of benzol without loss. The whole plant, it is mentioned, requires very little attention; the chief point being the temperature in the column head, which must not exceed 115° C., as beyond this point there is a danger of some of the washing oil being carried over. The distillate (which consists chiefly of 50 per cent. benzol) is, after condensation, run through a water-trap to separate the condensed steam, and is then ready for washing and fractionating for 90 per cent., which can be done together with the light oils recovered from the tar.

The following figures are submitted as a comparison between coalite tar and gas-works tar:

	Coalite Tar.		Gas-Works Tar.
Specific gravity	1·080	..	1·180
	Per Cent.		Per Cent.
Water	3-4	..	4-6
Light oils, 170° C.	6-8	..	3-4
Carbolic 235° C.	14-16	..	5-7
Creosote, 275° C.	16-20	..	12-14
Anthracene, 310° C.	16-18	..	8-10
Pitch	40-42	..	60 62

At the end of the pamphlet, there are quoted the working results of a 200-ton 24-hour plant, consisting of four batteries of forty retorts each, capable of "coaliting" 1·25 tons per retort per diem. The figures only refer to the working costs, and do not include any of the other expenses appertaining to the running of any business.

Costs and Yields on Working 200 Tons of Coal per Day Plant.

	£	s.	d.
Coal, 200 tons at 12s. 6d. per ton	125	0	0
Labour, including supervision, at 2s. per ton	20	0	0
Sulphate of ammonia costs	8	0	0
Water, stores, boiler fuel, and sundries	11	0	0
	£164	0	0
To gross profit	52	16	2
	£216	16	2

	£	s.	d.
Coalite, 130 tons at 20s. per ton	130	0	0
Breeze, 16 tons at 7s. per ton	5	12	0
Sulphate of ammonia, 28 lbs. per ton, 2 tons 10 cwt. at £14 per ton	35	0	0
Gas, total 1,700,000 cub. ft.; surplus 595,000 cub. ft. at 2d. per 1000 cub. ft.	4	19	2
Tar, 3600 gallons at 2¾d. per gallon	41	5	0
	£216	16	2

Tar Distillation.

			£	s.	d.
Tar, 3600 gallons at 2¾d. per gallon			41	5	0
Chemicals, fuel, &c., sulphuric acid	£1	4 0			
Water, boiler feed, naphtha washing, and CO towers	0	7 0			
Caustic soda and lime	1	11 0			
Carriage and casks	8	6 0			
Fuel, breeze for boilers, stills and causticizing	2	8 0			
			13	16	0
Labour, including half cost B.R.			1	14	0
1d. per gallon on rectified products for loss and stores			4	10	0
Washing oil for benzol recovery, 226 gallons at 3d.			3	6	6
			£64	11	6
To gross profit			35	19	6
			£100	11	0

			£	s.	d.
Total benzol from gas and tar, 340 gallons at		1s. 0d.	17	0	0
Cleansing spirit or light solvent	60 „	1s. 0d.	3	0	0
Rubber solvent	154 „	1s. 2d.	8	19	8
High-flash solvent	132 „	1s. 0d.	6	12	0
Rectified tar acid	310 „	2s. 0d.	31	0	0
Neutral oil	100 „	0s. 4d.	1	13	4
Tar acid, second grade	46 „	1s. 0d.	2	6	0
Pickling oil	576 „	0s. 3d.	7	4	0
Pitch	8 tons at	57s. per ton	22	16	0
			£100	11	0

	s.	d.
Profit on coalite plant per ton	5	3·37
Profit on tar distillery per gallon	0	2·39
Tar value finished products, including benzol from gas, per gallon	0	5·14
Profit on coalite plant per ton of coal distilled	5	3·37
Profit on tar distillation	3	7·17
Total profit per ton of coal distilled	8	10·54

The capital cost of a 200-ton plant per 24 hours, together with gas cleaning and storage plant, storage bunkers, telpher plant, tar-distilling plant, with storage tanks for the finished products, is given as follows:

Land, buildings, generating plant, &c.	£6,000
Setting and fitting of batteries	10,000
Gas plant	6,000
Telpher plant	3,000
Storage and screening plant	3,500
Producer plant	1,500
Tar distillation plant, with storage	10,000
	£40,000
Working capital	10,000
	£50,000

The capital (even excluding the tar distillation plant) in comparison with gas-works, with their large distribution systems and capital expenses, is very heavy. However, on the figures of the pamphlet an excellent return is shown:

200 tons of coal per day, for 300 days per year, at a profit of 5s. per ton	£15,000
Depreciation, amortization, &c.	5,000
	£10,000

There we may leave the review of the contents of the pamphlet, with the remark that a new tone has come over things, and more practical notions prevail. At the same time, looking over the details of the plant, the question arises which part or parts comprise anything in which the Syndicate can indisputably claim sole property. It would be a matter of interest to be enlightened as to this point.

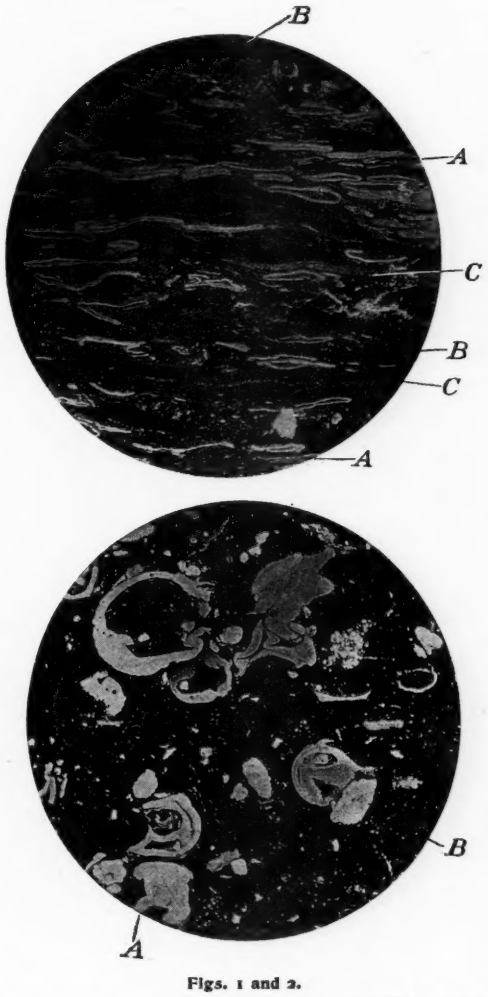
NOTES INTRODUCTORY TO THE STUDY OF COAL SECTIONS UNDER THE MICROSCOPE.

By Samuel Glover, F.R.M.S.

[Prepared for the Meeting of the Manchester District Institution of Gas Engineers.]

Gas engineers have their time so fully taken up in following their chief occupation of destructively distilling coals, that they have not much opportunity left to study the structure and composition of coals in their natural conditions.

Seeing, however, that we are to have the subject of the behaviour of coals in their raw state brought before our notice to-day in the paper prepared by Mr. Kendrick, I have arranged that opportunity be given, prior to the submission of Mr. Kendrick's communication, for a brief introduction to the study of this subject by the provision of an entirely new set of microscopic slides of coal sections which have been prepared for me by Mr. James Lomax, of Bolton. The vertical and horizontal sections on the slides, exhibited by the assistants in charge of the several microscopes, are from freshly-wrought pieces of coals and cannel from several well-known collieries. They are more or less illustrative of the theory, which is supported by the microscopical examination of various



Figs. 1 and 2.

Abram 4 feet or cannel seam coal (Tops) Maypole Colliery, Abram, near Wigan. Vertical and horizontal sections. The upper portion of this seam is composed mostly of large megaspores embedded in a ground mass of microspores and fine vegetable humus. A, megaspores. B, microspores. Magnified six times.

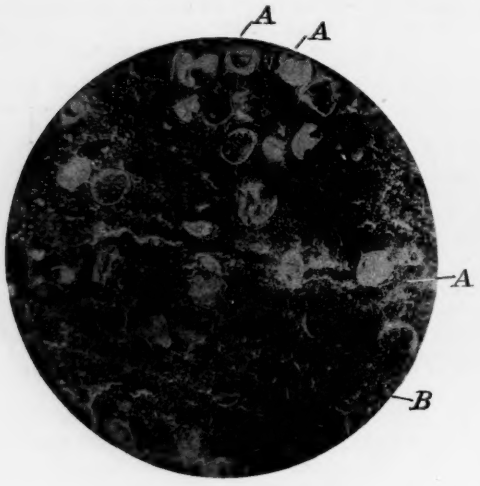
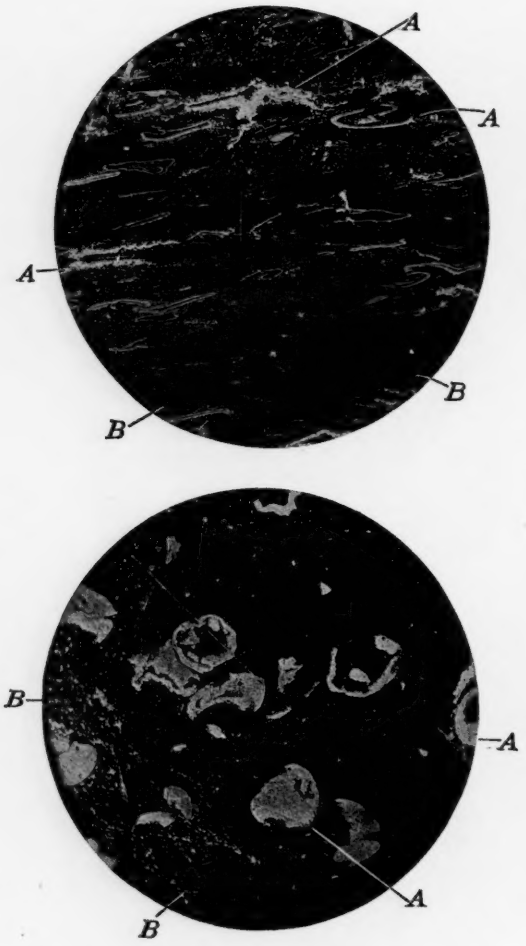


Fig. 3.

Trencherbone Hards or Tops, No. 4 Bank Pit, Hulton Colliery. Horizontal. This section is typical throughout the Trencherbone of the Lancashire district. It is essentially a spore coal—that is, composed of little but the remains of megaspores and microspores, the reproductive organs of the carboniferous lycopods. A, megaspores. B, microspores. Magnified six times.



Figs. 5 and 6.

Abram 4 feet or cannel, Maypole Colliery, Abram, Wigan. Vertical and horizontal sections. This seam is composed of three beds, the upper and lower being a bituminous coal, while the middle portion is a cannel. Both the upper and lower portions are composed of megaspores and microspores embedded in a ground mass of fine vegetable humus. The above sections are from the bottom. A, megaspores. B, microspores. C, vegetable humus. Magnified six times.

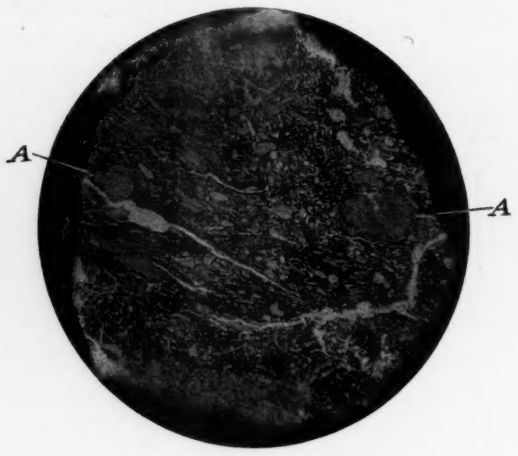


Fig. 4.

Plodder Holing coal, No. 3, Bank Pit, Hulton Colliery. Vertical. Some coals have in their lower regions bands of variable thickness, composed of more or less highly resinous looking bodies. These are well shown in the above section. The band varies from 2 to 5 inches thick. In the Yorkshire Silkstone, it is 8 inches or more, of a similar character to the Plodder. A, resinous bodies (*ovalites resinosus*). Magnified six times.

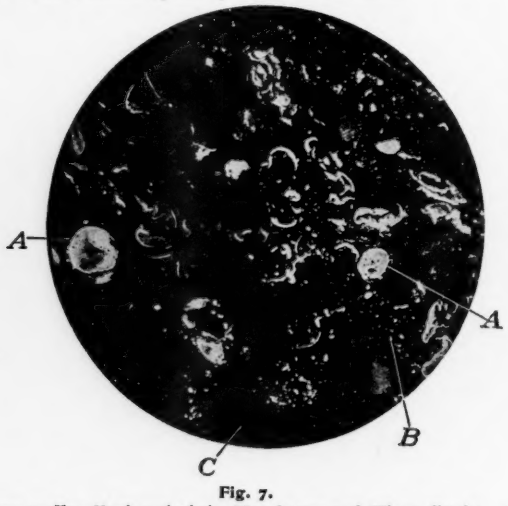


Fig. 7.

Rams or Two-Yard coal of the Manchester and Wigan district. Horizontal. This coal is composed of a large quantity of megaspores and microspores embedded in a fine humic mass of vegetable matter. A, megaspores. B, microspores. C, vegetable humus.

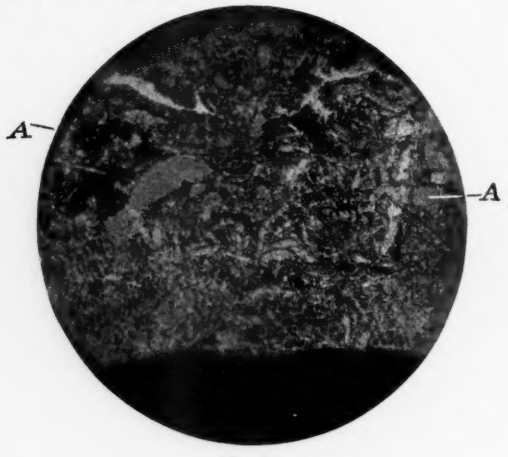


Fig. 8.

The same as fig. 4. Vertical section of the Plodder Holing coal. No. 3 Bank Pit, Hulton Colliery. Some coals have in their lower regions bands of variable thickness composed of more or less highly resinous-looking bodies. These are well shown in the above section. The band varies from 2 to 5 inches thick. In the Yorkshire Silkstone, it is 8 inches or more, of a similar character to the Plodder. A, resinous bodies (*ovalites resinosus*).

coals, that the chief constituents of the well-known seams are derived from the order of plants known as Lycopodaceous.

It will be seen, upon examination of the sections under the microscopes, that these constituents of the coals are made up, more or less, of resinous matter. This matter has seemingly been chiefly derived from the fructiferous organs, spores, &c., the leaves, and the globules of resinous and other matter dropped from the plants of the carboniferous ages. It will be noticed how little there is of actual vegetable tissues in many of the sections.

The absence of the remains of trunks of trees from our coal measures is clearly brought out in these investigations; and the deeper the subject is studied in the light of the microscopic sections

as taken from all the various parts of these well-known seams, the more the theory is supported which suggests that the coal measures are the leaf-mould, so to speak, of trees of enormous growth, and other plants which flourished abundantly under the atmospheric conditions which obtained during the carboniferous periods. The only remains of the trunks found in the coal are the fossil remains of stumps running upwards through the seams of coal, with occasionally branches and pieces of bark near the top of a seam, and rarely a trunk in the roof mud.

Certainly, a very striking fact revealed by a careful study of these sections is that in the upper portions of many seams the spores, which form so large a percentage of the composition of best gas coal, are found to be more plentiful; while nearer the floor, sunk down as it were among the carbonaceous matter, are the globules of resin-like matter which are found to be highly combustible. These various constituents of our coal measures are revealed in their natural colours in the sections under the microscopes.

Now, as the dust and smalls of coals are largely the result of the breaking-down of the lower portions of coal seams during the getting of the coal, and the lower portions appear to have a larger proportion of the highly inflammable matter undecomposed of the original vegetable origins of the coal (shown particularly in some Silkstone and Plodder Mine sections), these revelations, which have been literally unearthed by means of the microscope, may help us to study the value and behaviour under certain circumstances of the various coals we have to handle in such large quantities year by year.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at St. Helens.

The One Hundred and Sixty-Fifth Quarterly Meeting of the Institution was held at St. Helens last Saturday—under the presidency of Mr. SAMUEL GLOVER, the Gas Engineer and Manager to the Corporation. About eighty members were present.

INSPECTION OF ST. HELENS GAS-WORKS.

In the forenoon, an inspection was made of the gas-works; and the party subsequently proceeded to the Town Hall by special tram-cars, provided by the Corporation. Some particulars of the undertaking appear on the facing page.

THE LUNCHEON.

By the kindness of the Chairman and members of the Gas Committee, the visitors were invited to luncheon at the Town Hall, where the Mayor (Councillor James Crooks) extended a cordial welcome to the members, and expressed the hope that they would have a profitable business meeting. The Mayor, who is also Chairman of the Gas Committee, said that both he and the Committee recognized the compliment the Institution had paid the town of St. Helens in the election of their Engineer, Mr. Glover, to the presidency. It was very gratifying to them.

At the close of the repast,

The MAYOR proposed "Success to the Manchester District Institution of Gas Engineers." He said it had been his privilege to attend the proceedings of the Institution on a previous occasion, and he well knew that there were few institutions in the country that could show better work than the Manchester Institution. It was not only a great benefit to its own members, but to the community at large. The Institution had already achieved much; but he confidently looked forward to it acoomplishing greater things in the future. Notwithstanding the keen competition they had to contend with, gas was undoubtedly not only holding its own, but was gaining ground daily. It therefore behoved all those who were interested in gas to take advantage of every opportunity not only to maintain the position they had attained, but to strengthen it. With the toast, he coupled the name of the President, Mr. Glover.

Mr. GLOVER said it was a particularly pleasing duty to him—among his own people and in his own town—to respond to the toast. The Mayor had for the last six or seven years been Chairman of the Gas Committee, and the remarks he had made about the industry strengthening its position were the result of his own observations. He knew that Councillor Crooks was very much impressed by the serious way in which gas engineers conferred together. It was additionally gratifying to him (the speaker) to see that so many members had spared the time to pay them a visit. It was, indeed, a compliment to the town. He hoped the good work of the Institution would go on and continue to be successfully carried out. He was quite sure that so long as the members themselves persisted in taking such a deep interest in the success of the Institution as an Institution, and in their work as gas engineers of the day—work which was more onerous than it had ever been before—they would achieve even better things. He must refer to their Hon. Secretary (Mr. Whatmough), for without him it would be impossible for the work of the Institution to be done as it was done. "Presidents come, and presidents go," said Mr. Glover; "but secretaries, like Tennyson's 'Brook,' 'go on for ever'—or, rather, for so long as we can keep them." Mr. Whatmough's methods of working and his devotion to work were exceedingly helpful to him as President. Mr. Glover added that he had also to recognize, as he did most heartily, the help they received from the Technical Press. He said he believed in "praising the bridge which carries one over." So he gave due recognition to the technical and commercial press for their eminent services to the gas industry. He was sorry that Mr. Kendrick was not with them on account of ill-health; but he hoped, as he knew they all did, that he would speedily be restored to health again. After the discussion on his paper, he hoped the members would send him such a message of sympathy as would reward him for his labours.

Mr. J. C. BELTON (Chester), in proposing "Success to the St. Helens Gas Committee," said he thought the toast should have been "continued success," because, looking over the records of the past, as he had done, he found nothnig but a continuous record of success. Only the previous night, he had perused a gas directory for the year 1882; and he found that in that year St. Helens carbonized 12,000 tons of coal. At the present time they were carbonizing nearly 50,000 tons. The price of gas in 1882 was 3s. 2d. per 1000 cubic feet; to-day it was 1s. 11¾d. Thirty years ago, out of a population of 60,000, their consumers were 4·46 per cent.; but now, with a population of 96,000, they were 18·23 per cent.—the number having risen from 2677 to 17,505. These figures were a record of magnificent progress and magnificent success. It appeared to him that the Gas Committee had all along adopted and maintained the very wise policy of managing their concern to the most enduring advantage of the community. Nor had they been inattentive to the interests of the consumers, from whom they derived their profits. The result was that in St. Helens the Corporation were now able to supply cheap gas of good quality, and at the same time make a handsome contribution in reduction of the town rates. He was glad to see that this contribution did not amount to the same proportion of the net profits of the gas undertaking as applied in some other corporate towns, where he was sorry to find that the whole of these profits went in relief of the rates. From the standpoint of a gas company's engineer, he could not say that the appropriation of profits for the relief of the rates had his sympathy [laughter]; but there was something to be said in favour of a corporation who were so moderate as to appropriate only 50 per cent. of the profits. [Renewed laughter.] The St. Helens Gas Committee had kept out of their policy that which had done so much injury to other gas undertakings. If they read the history of the St. Helens gas undertaking, they would find that the "party spirit" had been carefully excluded from their transactions, and that instead of it public spirit had actuated their every motive. The St. Helens Gas-Works had for some time been known as a bright example of what could be achieved by intelligent enterprise, carried out in a businesslike manner, with the application of intelligent judgment to foster and develop improvements in works and methods. They had all been delighted in seeing that day an original installation of the Glover-West vertical retorts; but they had been still more delighted to inspect the later installation, which—he asked the members to pardon him making a personal allusion—only bore out what he said at St. Helens four years ago, that the discovery of defects was always to be expected in new inventions. He need not dwell on the subject. They all knew the means that had been adopted to remedy certain little matters; and the result was that to-day the vertical retort presented a degree of perfection which recommended it to every intelligent gas engineer. [Applause.] After adding that another important factor which conduced to the success of the St. Helens undertaking was the complete confidence which existed between Mr. Glover and his Committee and the employees generally—a point which he was sure all would appreciate—the speaker said he hoped Mr. Glover would long be identified with the profession, to develop with continued success the brilliant ideas which would occur to him for the improvement of the methods of gas manufacture. Referring again to the vertical retort installation, Mr. Belton said the St. Helens Gas Committee were rewarded for their enterprise in having that day one of the finest gas-making plants in the country. He felt that he ought not to sit down without saying a few additional words about the Glover-West retort, because they would remember that some time ago the profession was engaged in a warm controversy about inclined and other kinds of retorts. It was, of course, not for those present—as a Gas Managers' Association—to pronounce judgment upon the relative methods of one or the other kind of retort; but it was something to know that, while their Continental friends had erected something like 147 installations, only five of them were at British gas-works. On the other hand, the Glover-West firm had 32 installations at work or in hand, 19 of which were at British works. This, at any rate, was something to the credit of the British gas engineer, because he knew a good thing when he saw it; and when he saw what the article could achieve, he generally set about devising some method of improving it. [Laughter.] They had in St. Helens a thoroughly competent Gas Committee working on lines of continuous policy carefully carried out, making gas by a continuous process of carbonization; and he asked them to drink heartily to the health of the Committee.

Alderman BISHOP, one of the members of the Committee, responded. He said he had had twenty years' service on the Committee, and appreciated to the full the value of Mr. Glover's services.

MICROSCOPIC COAL PICTURES.

The members then proceeded to the lecture hall, where the business meeting was held. Before going there, however, they passed through the "microscopic room," where Mr. James Lomax, of Bolton, and his son, Mr. J. R. Lomax, exhibited a number of slides, taken at their Bolton laboratory, showing different sections of coal formation. Mr. Lomax, sen., has for years given much thought and consideration to this important geological question.

The slides, which showed in colours the various constituents of the coal, were very instructive and much appreciated.

General Business Proceedings.

The business proceedings were very brief—presumably with the idea of devoting as much time as possible to the consideration of Mr. Kendrick's paper. A letter of apology was read from Mr. Corbet Woodall, who said that it was a matter of deep regret to him that he was not able to be present that day. Many other letters were also read.

New Members.

The following new members were elected: Mr. Fred. Betley, of Wigan; Mr. W. Harold Chester, of Middleton, Lancs.; and Mr. Charles Oswald, of Conisborough.

Vote of Thanks to the St. Helens Corporation.

Mr. E. Allen (Liverpool) proposed, and Mr. R. G. Shadbolt (Grantham) seconded, a hearty vote of thanks to the Chairman and members of the St. Helens Corporation Gas Committee for their hospitality.

Grant Towards University Lectures.

The Hon. Secretary said the Committee recommended that a sum of £15 be contributed towards the cost of lectures at the Manchester University.

A Member asked what the contribution was last year, and whether the funds of the Institution "would stand this drain."

The President replied that the funds were capable of withstanding the extra £5.

Mr. E. A. Harman (Huddersfield) proposed, and Mr. W. Hill (Stalybridge) seconded, the grant, which was agreed to.

Juniors Invite Seniors.

The following letter, dated Nov. 6, was read from Mr. D. V. Hollingworth, of the Birchenwood Colliery Company, Kidsgrove, Staffs.

> At the last Council meeting of the Manchester and District Junior Gas Association, I had the honour of suggesting that the Council should invite the members of the Manchester District Institution of Gas Engineers to join them on the occasion of their visit to Birchenwood on Jan. 11, 1913.
>
> I am glad to say that my Council unanimously and enthusiastically approved of the invitation being given; and I now, on behalf of my own Association, and also as manager of the works concerned, very cordially invite the members of the Senior Institution to accompany the Juniors on that occasion.

The President said he thought such an arrangement would meet with the approval of the members, and he hoped they would accept the invitation. He had no doubt a visit to the Birchenwood coke-ovens and bye-products works would be interesting to all of them.

Mr. T. Duxbury (Oldham) moved that the invitation be accepted.

Mr. Harman said a visit to Kidsgrove was undoubtedly desirable; but he thought it should be fixed for later in the year.

The President remarked that perhaps it would be as well if the members approved the principle. They could then confer with the Juniors in regard to a suitable date.

This course was agreed to.

Mr. Kendrick on Coal Storage and Coal Fires.

The President read the paper on the above subject, prepared by Mr. H. Kendrick, of Stretford, copies of which had been supplied to the members. It will be found, with the discussion to which it gave rise, on pp. 741-51.

Officers for the Ensuing Year.

The Scrutineers, Messrs. G. S. Sayner (Harrogate) and J. Buckley (Formby), announced the result of the usual balloting for the election of officers for the ensuing year, as follows:

President.—Mr. J. C. Belton, of Chester.
Vice-Presidents.—Mr. E. A. Harman, of Huddersfield, and Mr. J. G. Newbigging, of Manchester.
Hon. Treasurer.—Mr. Thomas Newbigging, of Manchester.
Hon. Secretary.—Mr. W. Whatmough, of Heywood.
Committee.—Mr. J. W. Allin, Mr. J. W. Turner, Mr. J. Smith.

The President, in congratulating Mr. Belton on his unanimous election, said the honour was worthily bestowed.

Mr. Belton thanked the members for their expression of approval of his services. He assured them that he felt it a great honour to be called upon to occupy the distinguished position of President of the Institution. So far as he was concerned, it would be his earnest endeavour to maintain the dignity of the chair—a dignity which had been so well sustained in the past.

The President said they would all be glad to hear that Mr. Whatmough had been induced to continue in office as Honorary Secretary for another year. His intention was to have retired this year; but he had, at the earnest wish of the Committee, agreed to continue in office for a while longer.

Mr. Whatmough acknowledged the compliment. He thanked the members for their hearty appreciation of his services, but intimated that he would retire at the end of the next twelve months.

Silver Wedding Congratulations.

Mr. and Mrs. Glover subsequently entertained the members to tea in the Town Hall.

Mr. E. Allen (Liverpool), in proposing a vote of thanks to their host and hostess, said his association with Mr. Glover extended for 25 years—a period which corresponded with Mr. Glover's happy married life.

Mr. E. A. Harman (Huddersfield), in the course of a humorous speech, said that, curiously enough, he recently discovered that his own silver wedding had taken place this year. He had, therefore, every sympathy with Mr. Glover (laughter).

Mr. Glover returned thanks, and the proceedings terminated.

ST. HELENS AND ITS GAS SUPPLY.

In connection with the visit to St. Helens last Saturday of the Manchester District Institution of Gas Engineers, the Engineer and Manager (Mr. Samuel Glover, M.Inst.C.E.), this year's President of the Institution, prepared the following particulars as to the works and gas supply under his control.

The public supply of gas in St. Helens was established some 78 years ago by the St. Helens Gaslight Company, whose works were built upon part of the present site. Gas was then sold at the price of 10s. 6d. per 1000 cubic feet.

The works were purchased by the Corporation (under the provisions of the St. Helens Improvement Act, 1869, at the price of £131,600) on June 30, 1875; and they have since been wholly reconstructed by them—the capacity of production and distribution being increased by more than six times. The net capital debt, however, was not more at March last than it was when the old works were purchased 37 years ago. They now comprise: Plant capable of manufacturing 3,250,000 cubic feet of gas per day; plant for the manufacture of sulphate of ammonia; plant for the distillation of tar; storage at Warrington Old Road for 750,000 cubic feet, and at Knowsley Road for 1,500,000 cubic feet.

The limits of supply are the borough of St. Helens, and the townships of Ashton-in-Makerfield, Eccleston (part of), Haydock, and Windle.

The price of gas per 1000 cubic feet is, for motive power, 1s. 6d. inside the borough, with 2½ per cent. discount on monthly accounts; 2s. outside the borough. For lighting at the date of the purchase 4s. and 4s. 6d. net were the prices respectively. Now, inclusive of the hire of meters, when supplied through ordinary meters, it is 2s. in the borough, and 2s. 6d. outside—subject to the following discounts:

20,000 to	50,000 cubic feet per annum . . .	5 per cent.
50,000 to	100,000 ,, ,, . . .	7½ ,,
100,000 to	1,000,000 ,, ,, . . .	10 ,,
1,000,000 cubic feet and upwards per annum . .		12½ ,,

When supplied through prepayment or coin meters, it is 1d. per 38 cubic feet in, and 1d. per 32 cubic feet outside, the borough. Rents for meters are abolished, and they are now supplied and fixed free of charge. Stove rent has also been abolished; and they are now supplied free—cost price only being charged for materials used in fixing.

Annual Make of Gas.

Year Ended March 31.	Cubic Feet Manufactured.	Average Illuminating Power.
1880 ..	111,800,600 ..	18·52
1885 ..	148,696,900 ..	18·59
1890 ..	186,973,300 ..	18·47
1895 ..	230,776,700 ..	18·77
1900 ..	327,332,100 ..	19·12
1905 ..	392,877,500 ..	18·44
1907 ..	427,612,200 ..	18·01
1908 ..	460,864,300 ..	18·00
1909 ..	465,252,060 ..	17·79
1910 ..	462,652,700 ..	18 07
1911 ..	488,061,800 ..	18·18
1912 ..	501,444,400 ..	17·69

The total capital expenditure to the 31st of March last was £377,741.

The price of gas was lowered by 2d. per 1000 cubic feet to all classes as from the 1st of October last. Meter-rents were abolished in 1891. Prepayment meters were introduced in 1890. Stove-rents were abolished in 1895. On March 31 last, there were 18,050 consumers' meters at work; 7600 gas-ovens; 1813 heating stoves of various sorts; and 7006 boiling burners.

In addition to providing for the consumers' needs to the extent shown and the constant writing-off of capital expenditure, there has been paid over to the Corporation the sum of £102,030 since the works became the property of the Corporation.

The last gas-works extension scheme was commenced in 1907, when the first installation of Glover-West continuous vertical retorts was decided upon. This was completed and working in October, 1908, and was visited by the Institution under the presidency of Mr. Morrison, of Sheffield, in 1909. The same retorts are to be seen at work to-day—this being in their fifth winter, with only two occasions upon which they have been let-down for the repair of the furnace and the pointing of the retorts.

The newer installation on the site of the old baths has further proved the advantages of the system; and the Committee have now under consideration the replacement of the old horizontal settings (as worn out) with this system, "which has spread from the town of its upbringing and been adopted by many large corporations and gas companies in the United Kingdom and abroad."

In the year 1911, the Council authorized the erection of a new suite of offices for the works' staff, along with a showroom, at a cost of £3000.

COAL STACKING AND COAL FIRING.

By H. KENDRICK, of Stretford.

[A Paper read before the Manchester District Institution of Gas Engineers, Nov. 30.]

Whatever may be our private opinions as to the coal-miners' actions in enforcing their demands for better conditions and higher wages, we shall agree that it will be necessary in the future to carry heavier stocks of coal in our gas-works, to prevent many of us again being in the unfortunate position we were in last March and April, when famine prices were paid for our raw material, and many gas-works were nearly or entirely stopped for want of supplies.

The question of coal storing naturally divides itself into four heads: (1) Coal-stores; (2) coal stocking; (3) coal fires; (4) deterioration of stored coal. All these questions have been more or less definitely dealt with by many others better able to give a definite opinion than the writer; and twelve months ago Mr. E. A. Harman read a paper before the Institution on this subject, in which he touched on many aspects of it. There also appeared in the "JOURNAL OF GAS LIGHTING" for Sept. 3 an important article on the same subject by "Almea;" and in the "Colliery Guardian" for Oct. 18 last there is the report of a lecture by Dr. John Harger, M.Sc., Ph.D., on "Gob-Fires and the Prevention of Gob-Fires in Mines," delivered before the members of the Manchester Geological and Mining Society. I propose applying the up-to-date information in these and other papers to the elucidation (if possible) of the causes of numerous fires in coal-stores of gas-works that have broken out since March last. I have also laid under contribution in my search for information many of the most important gas-works in the area of the Manchester Institutions, and many colliery officials also. The results of these inquiries will be found in the appendices, to which I shall only make general references.

The quantities of coal to be stored by individual works is one entirely outside this inquiry, as it is a question that has to be decided by their responsible officers, and is subject to such varying conditions that no definite rule can be set down to meet all cases. The description of coal-stores, whether the coals shall be stored under cover or in the open, in bunkers or divided stores, except so far as it helps the immediate scope of this paper, and the deterioration of coals after stocking, I do not propose dealing with. The main points that I wish to bring out are the effects of stacking generally upon the physical condition of the coals, the dangers attending the same, and the precautions to be taken. My inquiries have been directed very naturally along those paths that have been most impressed upon myself lately; and as in the past four years we have had at Stretford three serious fires in our coal-stores, and many cases of overheating, a description of our coal-stores and plant, and methods of dealing with them, will perhaps lead to a better understanding of what is underlying the ideas with which I commenced this inquiry. We have three covered coal-stores:

No. 1	with a capacity of	1800 tons
No. 2	,, ,,	1400 ,,
No. 3	,, ,,	800 ,,

No. 1 was originally partly an old retort-house; the original store portion being roofed without louvres, the other part having the usual open louvred roof. No. 2 store, adjoining No. 1, is roofed without louvres. No. 3, on the opposite side of the retort-house, has a corrugated iron roof in two spans. Nos. 1 and 2 stores open on to the Bridgewater Canal, and are served by a bucket elevator for discharging the coal-barges. This elevator lifts the coal on to a plate-belt conveyor (which runs the full length of No. 1 store), which has scrapers arranged to deliver the coal right or left as desired, or over the end into the breaker and elevator serving the retort-house. No. 2 store is served by a cross conveyor from No. 1 store at the end nearest the canal, and a second long plate-belt conveyor, the same as that in No. 1 store, running its full length. The coal in No. 1 shed can be stacked 24 feet high, and in No. 2 shed 20 feet high, in truncated cones, the apices of which will be about 8 feet wide. In this way both sheds canbe filled to about two-thirds their capacity without trimming. In No. 3 shed is stored the coal that is carted from the railway. This is hand stacked to an average height of 14 feet. Most of our troubles have occurred in No. 1 shed, although we have had one fire in No. 2 shed and once had to move a large quantity of coals in No. 3 shed that were heating-up dangerously high.

Usually 75 per cent. of the coal received passes up the main elevator and on to the conveyor in No. 1 shed; and as over 80 per cent. of the coals received are slacks, many precautions have to be taken. As a rule, we never stack the finer slacks; and when discharging the rough slacks, the conveyor scrapers are so arranged as to allow the dust and very small to pass direct to the retort-house, where they are carbonized at once. However careful we are, there is always a considerable quantity of small scraped off with the nuts, and dropped at the conveyor sides, where it accumulates at the apex of the cone formed by the descending coal—the nuts and larger pieces rolling to the bottom. There is also a considerable quantity of fine dust shaken through the joints of the conveyor plates and brought back by the conveyor itself on its return journey and deposited underneath; and it is to this accumulation of dust and very small coals that I attribute many of our troubles in this store.

It has been our practice up to this year to deposit the large coals received in the halves of both Nos. 1 and 2 sheds nearest the canal, following on next with the nuts, and finally the slack, when necessity compelled us to stack same. On emptying No. 1 shed, when on fire in 1908, we found, at the junction of the nuts and slacks, alternate layers of varying thicknesses. The fire had spread in the nuts, and not in the slack; the nuts had caked into a solid mass, while the intervening layers of slack were quite loose, though very hot. This particular fire was most likely started by a steam-pipe which had had its protective coating destroyed. During the removal of the coal from under the conveyor, we found the continuous deposit of dust and fine coal several feet deep and wide. Everywhere it was hot, and it often broke into flames when disturbed and air admitted to it. We adopted the drastic method of moving all the coal in the shed, and spreading it out in the yard as the most effectual and quickest method of dealing with the fire. We used as little water as possible, and that only to confine the fire to a small area. To quench the flames and red hot fuel as we reached it, we sprayed the blazing surfaces with strong ammoniacal liquor. Very little of this was required; and it was much more effectual than water, as there was no danger of either driving the fire further in or adding to it, as is often the case when water alone is used.

The lessons we learned have carried us over four years without further serious trouble. After each boat is discharged, men are sent into the shed and the accumulation of dust and fine coal is dug out and scattered over the remainder of the heap. Wrought-iron tubes were inserted at intervals into the stacks, by which the temperatures of the interiors could be watched. All went well until this present year, when we had another outbreak. The same measures were taken as previously in dealing with the fire; but we found that our immunity for three years had led to laxity, and the digging-out of the small and dust from underneath the conveyor had only been partially carried out—everywhere where small was found was heat. This, however, was not the immediate cause of the fire. We had in this store a quantity of screened coals left in stock at the close of the strike. When deliveries were resumed, the new coals were deposited on this old coal until the store was filled to its utmost capacity in about six weeks. On emptying the shed, we found the tongue of rough coals running under the slack was completely carbonized, that the fire was creeping along the floor under the slack, and spreading backwards into the stock of screened coals. There is no doubt in my own mind, in the light of later information, that the fire was due to oxygen absorption by the freshly-wrought slack—the air reaching the slack through the old stock of screened coals. The temperatures taken in the tubes showed a gradual rise up to 90° Fahr., then a quicker rise to 110° Fahr., and then a sudden jump to over 300° Fahr. As we were over a week before we got to the seat of the fire, it had spread considerably before it was finally extinguished.

In connection with this particular fire, there are several matters that appear to be common to many of the fires which have occurred at other gas-works in the past few months. The weather during the time of stocking was very dry and hot; the highest temperatures (except for a few days) experienced this year being in May. The coals were delivered and stacked with extreme rapidity. The slacks received at first were much dustier than usual, and the temperatures of the slacks themselves as delivered were much higher than usual. It is with the idea of endeavouring to trace the combined or individual influence of these facts that led me to embark upon this investigation, as I am still of opinion that coals mined and stored under the conditions prevailing in April and May last were much more liable to spontaneous combustion than those mined and stored under more normal conditions, as witness the large number of fires reported in the past few months.

All the mining authorities consulted are of one mind—that the coal raised in April and May last would not be so much higher in temperature than usual as to affect any heating on storing. The views and ideas are so diversified, that I have made extracts from the letters and embodied them in the Appendix I. The main outstanding points in this information given by the colliery agents are:

1.—Coal delivered in April and May, 1912, not unduly heated.
2.—Weather conditions unfavourable:
April and May too hot and sunny.
Later months, too wet.
3.—Conditions of coal as mined would be more unfavourable; in many mines coal would be damper.
4.—Insufficient care in cleaning the coals at the colliery, owing to working at extremely high pressure.
5.—Presence of large proportions of dust and small, as coal at the face would be much more crushed during the long stoppage, particularly in old coalfields.
6.—More freshly-wrought coal put into stock than usual. Freshly-wrought coal absorbs oxygen greedily; fine coal even more so than screened coal.
7.—Coals stocked more rapidly and thicker than usual, not given sufficient time to settle and cool.
8.—Stocking coals by conveyors and not mixing afterwards.
9.—Stocking in two great bulk and height.
10.—Stocking unsuitable coals in time of stress.
11.—Lack of ventilation in coal stocks.

In order to help us to arrive at a conclusion, I propose to examine these statements in the light of common knowledge and other available information.

Temperature of Coal Deliveries.

Most replies from gas managers (Appendices III. and IV.) indicate that no notice has been taken of the temperatures of coal received at the gas-works. Where noted, the differences between the atmosphere and the coal varies from 3° to 14° Fahr.; but it is not possible to say if those in May were higher or lower. In our own observations, much of the coal then delivered was distinctly warm to the hand; but we did not take any records. Since July last, records have been taken regularly; the readings always being higher than atmosphere, varying from 2° to 12° Fahr. in the summer to 4° to 20° Fahr. in the winter; the coal from one seam giving the highest readings in each period.

The opportunities of cooling *en route*, as stated by one of the colliery agents, is not quite so great as he endeavours to make out. The coal is always raised direct from the pit, screened, and loaded into waggons, where it would cool very slowly. In the process of stacking in most works, it would not be handled more than twice, and often once only, and then with extreme rapidity. Once in the stack, the rate of cooling would be extremely slow again. In our case, the waggons are loaded directly into barges; the operation only taking a minute or two for each waggon. On arrival, they are discharged by an elevator and stacked in bulk immediately; there being very little exposure to the air, and cooling less than when hand stacked. If, however, there had been any undue heating of the coal during the stoppage of the pits, no doubt the number of fires would have been much greater than has been actually the case, and some other causes must be looked for as the primary, although it is possible that, in individual cases such as ours, over-stacking before cooling may be a contributory cause.

Weather Conditions.

The higher temperature of the atmosphere in April and May may have prevented the cooling of the coals put into stock and in transit, but could hardly, in this country, be responsible for fires. The wetter months following may also have added the quantity of moisture that would increase the percentage over the border line of safety. But there is no direct evidence produced in favour of this proposition. Mr. Harman, in his paper read in October, 1911, states that the New South Wales Government report for 1901 recommended wetting the coal when the temperature of the air rose to over 90° Fahr., to prevent spontaneous combustion. But as we do not experience such temperatures, we ought to be safe from trouble, unless other conditions arise at the same time. "Almea," in his able article on this subject, does not refer to this point, nor did Dr. John Harger, in his lecture on "Gob-Fires," except to dispute some statements of Messrs. Haldane and Meachem, who remarked that "sufficient heat to raise the air to 212° Fahr. (unless otherwise absorbed) is always being formed in a mine; the air being in consequence hotter than the strata." Dr. Harger says these conclusions are wrong, "and that the whole rise in temperature of the air in the mines is due to the natural temperature of the earth, which, in a pit 1800 feet deep, would be about 90° Fahr." We therefore see that it is possible for coal to cool considerably (from 90° Fahr.) in transit, and yet arrive at the gas-works higher than the temperature of the atmosphere, even in the summer.

The wet weather of the later months would not affect the coals rushed into stock immediately after the coal strike ended, nor account for the earlier series of fires, but may be responsible for those occurring later. Here, again, the trouble is more likely to affect slacks than screened coals. While rain penetrates nuts and screened coals readily, it rarely does so with slacks; the wet being confined to an inch or two on the surfaces. This is rarely removed, and no doubt, mixed with dry slack on discharging, may give rise to heating, which, if unchecked, would cause fire. Hence slacks and unscreened coals put into stock in wet weather should be very carefully watched for a long time.

Mining Conditions.

Several of the colliery agents call attention to the great pressure exerted on the coal at the face, due to settlement of the earth on the removal of the coal. They state that during the stoppage this would materially affect the physical condition of the coal, causing it (especially the softer varieties) to be obtained smaller than usual; and the higher percentage of dust and small might cause quicker heating up. It is also suggested that, owing to the stoppage, the coal, when work was resumed, might be much damper. This is, of course, possible, as in many mines the atmosphere is certainly moisture laden, and many pits are wet. This can only be a conjecture, as it is now impossible to determine the point. It would be interesting if some investigations were made on this question when opportunity occurs.

Coal Insufficiently Cleaned.

That this does occur, even at ordinary times, will be admitted by all, and there is often more trouble in the winter during the rush. But as coals are not stacked during this time, the effect of the excess rubbish on the overheating cannot be noted. The prevailing conditions in April, May, and June last were similar to the winter months. Everyone wanted coal; the collieries wanted to get it away; and it is just possible that the coals were insufficiently cleaned—indeed, I had to call the serious attention of several of our contractors during these months to faulty cleaning. One condition necessary to start a fire with excess of pyrites was absent during these months—the coal, if anything, owing to the entire absence of rain, was drier than usual; so that unless it was damp when raised from the pit, this suggestion as a possible cause is valueless.

Our ideas that spontaneous combustion is mainly due to the oxidation of pyrites has lately been rudely shattered. As "Almea" points out, "while some coals containing a very high percentage of pyrites are quite safe, those containing a small proportion often give great trouble when stacked. . . . There seems to be little doubt then, that spontaneous combustion is the outcome of several causes, and that while pyrites itself is not alone responsible, it plays some subsidiary part in assisting the action. Factors such as the size, dampness, proportion of volatile matter, and general composition, all play their part in bringing about a rise in temperature."

Stacking Freshly-Wrought Coal.

There being an entire absence of stocks at the collieries when work was resumed, it follows that all the coal put to stock was freshly wrought. Professor Lewes, in one of his "Cantor" lectures last winter, says: "Coal exhibits, to a lesser extent, the same property of absorbing gases that charcoal does. The least absorbent will take up one-and-a-quarter times its own volume of oxygen; while many bituminous coals will absorb more than three times their volume of the gas. . . . The resin bodies, the compounds present in the coal, are the bodies most likely to possess this property; and it is to chemical actions so caused that lead to slow combustion, and, when accelerated by any rise in the surrounding temperature, is capable of generating sufficient heat to lead to the spontaneous ignition of masses of broken coal large enough to prevent the escape of the heat as developed."

"Almea" states that "after a time the lumps get coated with an oxidized surface, and their absorptive properties become less vigorous until new surfaces are exposed by the breakage of lumps, &c." Pressure on the mass will cause the breaking-down of the lumps in the stack, and the presence of dust and fine coal will prevent the dispersion of the heat caused by the absorption of oxygen. "Almea" says, again, "The greater liability of some coals to fire is due not to the sulphur they contain, but to their proclivities for absorbing oxygen; and the greater quantity of oxygen absorbed the greater will be the tendency to fire. The heating effect, too, is probably cumulative; for a rise in temperature increases the capacity of the coal for taking-up oxygen."

Coals Stocked too Rapidly.

I have already shown that the temperature of coal when got will be somewhere about 90° Fahr., and the rapidity of cooling before it is stored will depend on the number of times it is handled, the time taken in transit, and the bulk in which it is delivered. The temperature of the coals in barges as delivered at Stretford during the past four months has averaged 67° Fahr., or 8° Fahr. above atmosphere. One coal averaged 11° Fahr., and another 10° Fahr., above atmosphere. If this is stacked rapidly and in heaps, or is not spread or time allowed for it to cool, the temperature will fall only slowly; and if the coal contains dust and small, slower still. At such a temperature, the coal will be in a condition for a more rapid absorption of oxygen than if at atmospheric temperature—resulting in a further rise, which, if not dissipated, may lead to overheating and firing.

As already stated, there are at Stretford three coal-sheds, each filled separately and with different classes of coal:

No. 1 Shed.—This is usually rapidly filled up with rough slack, stacked from overhead conveyors.

No. 2 Shed.—Filled up slowly with nuts and screened coals, stacked from overhead conveyors.

No. 3 Shed.—Filled up rapidly this summer with mainly unscreened coals stacked by hand.

The condition of the coals in each shed was, and is now, different.

No. 1 Shed.—Temperatures have shown a gradual rise from the minimum, then a period of quiescence, and are now falling slowly.

No. 2 Shed.—Temperatures gradually fell to atmospheric.

No. 3 Shed.—Temperatures rise quickly, then fell rather less quickly, and all except one part are now only slightly above atmosphere.

The following table shows the temperatures of the coals as recorded by us daily.

—	No. 1 Shed. Rough Slack.				No. 2 Shed. Screened Coals.				No. 3 Shed. Unscreened Coals.			
	20th day.	40th day.	60th day.	80th day.	10th day.	40th day.	60th day.	80th day.	10th day.	40th day.	60th day.	80th day.
Tube No 1 . .	62	68	86	83	66	62	65	63	64	63	63	60
,, ,, 2 . .	62	67	75	70	63	61	62	58	70	63	69	68
,, ,, 3 . .	62	65	70	66	63	58	59	57	66	62	64	59
,, ,, 4 . .	60	63	67	67	65	58	61	54	65	60	62	59
Atmosphere . .	60	58	55	52	64	58	64	54	56	58	59	54

The coal that fired in No. 1 shed last July was stacked even more rapidly than that now there. In both cases the coals were drawn from the same pits; the quality and size being the same. The only difference in the conditions was that there was a small

stack of screened coals covered by slacks which had not been levelled-down; whereas now the stock is all slack, and between deliveries the small was dug out and the whole conical heap levelled-down and not covered over for some days. In the first case, the coal fired in less than three months, and in the latter the temperatures after three months have not reached the critical point, and have been falling for over a month. It therefore seems necessary when stacking freshly-wrought coals, and more particularly slacks, that extra precautions must be taken.

Stacking from Conveyors.

This very convenient and economical method of forming coal stacks is evidently viewed with suspicion by many colliery agents as a possible source of danger; and our experience has certainly proved the necessity of special precautions being taken, as already narrated. The accumulation of dust and fine coal at the apex of the cone formed by this method of stacking being peculiarly liable to heating owing to the avidity with which small coals absorb oxygen. It is also at this point that any damp coal will collect, should there be any in the cargo, either from rain or a leaky boat. The same thing occurs when grabs are used for discharging, or if coal is tipped from carts or waggons from a height—except that probably the separation will not be so complete; and in each case the same precautions are necessary.

Bulk and Height of Coal-Stacks.

Our attention has been directed to this matter many times; but practice varies so much that it is impossible to do more than strike an average. The heights suggested for small coals are as follows:

	Minimum Feet.	Maximum Feet.	Average. Feet.
Coal-owners	11 ..	15 ..	13
Gas-works practice	10 ..	30 ..	18

Gas managers are apparently in the habit of stacking coals much higher than the coalowners themselves would do so. It must be remembered, however, that coal at the colliery is always stacked in the open; while coal at the gas-works is largely stacked under cover. Owing to the necessity of allowing the coal first put into stock to cool before being covered over, and the slow cooling of small coals, it certainly seems to be desirable that coal under cover should not be stacked so high as in the open; whereas the reverse appears to be the practice at many works. There are economic reasons (such as ground space and costs of buildings or roofs) that would lead us to stack as high as we can with safety; but if there is to be greater danger from firing in consequence, we shall have to take the lesser of two evils and provide more storage area.

Several authorities refer to the effect of the pressure exerted on the coals by high stacking, the breaking-down of the lumps, and opening-up of fresh surfaces for absorbing oxygen, the heat generated by the movement of the coal on itself in the settling-down of the heaps, and the closeness of the heaps under pressure preventing the dissipation of the heat generated under the first-named condition. All are points worthy of consideration; and as we have stated that the total heat evolved is due to a number of small causes, the elimination of one or more reduces the chances of trouble. "Almea" bears out these conclusions in his article, when he says: "It appears that there is some relation between the liability to spontaneous combustion and the height and volume of the heap in which it occurs. There also appears to be a 'critical height' above which it is undesirable to go; and for ordinary coal this ranges between 15 and 20 feet."

Dr. Harger also says: "Fires have occurred in galleries of old workings by the pressure of the subsiding strata crushing the coal and the accumulation of dust, and by interfering with the ventilation the heat generated is not taken away, and often a fire ensues."

Stocking Unsuitable Coals.

This is made a strong point by many people; but the information given as to what are suitable coals is rather indefinite. The best I can do is to suggest they should be the harder varieties—soft varieties readily breaking-down to slack. The coals should be dry and as clean as possible and the pyrites low—not only that generally easily seen in lumps and plates, but also that intimately mixed with coal substance in fine crystals and dust.

Ventilation.

The vexed subject of ventilation of coal stacks has its strong advocates, both for and against, and both can produce arguments to favour their particular views. One of the largest collieries we deal with has sent me a proposal for ventilation, which is given in Appendix II., and others have recommended ventilation as the best method of keeping-down fires—generally on the assumption that they are mainly due to moisture and pyrites. But as coal cannot fire without oxygen, and as increased oxygen supplies would mean increased heat both by the oxidation of the resin constituent as well as the pyrites, unless the ventilation is so great as to convey away the heat as fast as it is generated, and the volume of air passing any given point was not unduly heated, it seems to me that the remedy would be worse than the disease. I prefer to try and prevent oxygen getting into the interior of the coal-stack and checking undue heating by the absence of oxygen, instead of trying to hurry matters by increasing the ventilation. "Almea" recommends this, as does also Mr. Harman in his paper at our last autumn meeting. Dr. Harger says one of the most frequent sources of gob-fires in mines is due to short-circuiting in the ventilation. "The short-circuiting of air explanation is borne out by the fact that this class of heating is often caused or developed by a fall at or near the face, preventing the usual fire ventilation in its normal course, and, presumably, increasing the amount of air short-circuiting. Also it has been observed on several occasions that on increasing the water-gauge to remove a troublesome quantity of gas in a district, by giving it more air, heating in the wastes have followed serious enough to necessitate digging out, and, *vice versâ*, heatings in early paraffin stage have often been stopped and put out by decreasing the ventilation in the district affected." This and the use of inert gases for extinguishing fires was endorsed at the lecture by many speakers, including mining officials and H.M. Inspectors of Mines. We are therefore in good company when recommending no ventilation.

Dealing with Coal-Stack Fires.

The information dealing with this has been so fully set out in "Almea's" article and Mr. Harman's paper, that it is unnecessary for me to go into the question fully. I agree from my own experience with most of what has been stated; but I should like to emphasize the statement that if water is to be used in quenching a coal fire, the volume must be enormous. It must not be overlooked that a jet of water will set the air in contact with it in motion and induce a draught in the direction of its flow, and will actually carry oxygen to the seat of the fire. As Mr. Tysoe says: "The quantity of water required to overcome the fire is incredible." More than one of our members will remember a coke fire at Saltley. A large number of jets from the street mains were pouring water on to it for days; and finally it was only by cutting a road through the heap and attacking the fire from all sides that it was subdued. The quantity of water used amounted to millions of gallons.

"Almea" says sand is sometimes used, but rather seems to recommend removal with the use of water. The plan we adopted at Stretford was to ply the unaffected coal with water, and the affected coal with strong ammoniacal liquor from the scrubber well—*i.e.*, that containing the largest quantity of inert gases in solution, which, liberated by the glowing fuel, had a far greater and more lasting effect than water. There should be no difficulty in finding ammoniacal liquor on a gas-works. Dr. Harger and (with one exception) the speakers at his lecture all recommended restricting the air flow and the use of inert gases in putting out gob-fires.

If the tabulated information in the appendix be referred to, coal fires in this area appear to be most prevalent at the works which employ modern appliances for stacking purposes, or make use of natural conditions of site and tip into stores from an elevated road, and also at works which largely use slack and unscreened coals in their carbonizing operations. It appears likely that the proneness of slack to heating is mainly due to the larger proportions of dust and fine coal, and that pyrites only plays a secondary, but still important, part in the process. Where fires have occurred in screened coals, the causes most likely will be pyrites and moisture.

The bearing of the character of the various coal seams to the question, the influence and composition of the volatile constituents of the coal, and the methods of storing, in the open or under cover, in large heaps or subdivided by walls or spaces, must be left to another writer, who I hope will take up and complete the work. I propose ending my already too long paper by giving "Almea's" suggestions for the prevention and treatment of fires, together with several of my own that experience has taught me.

(1) Stack different seams of coal in separate heaps.
(2) Stack different classes of coal separately.
(3) Do not stock fine slacks.
(4) Do not stock damp coals under cover.
(5) Surface ventilation only.
(6) Mix lumps or nuts and fine thoroughly together.
(7) Small heaps are less dangerous than large ones.
(8) Do not pile higher than 20 feet in the open or 16 feet under cover.
(9) Avoid external sources of heat.
(10) Avoid leaking roofs, gutters, or pipes.
(11) Record temperatures of coals as received.
(12) Record temperatures of coals in stock.
(13) When temperature of stack rises to 90° or 100° Fahr., remove top layers and watch carefully.
(14) Do not disturb fire by pushing in bars, &c., particularly from side of heap.
(15) Do not apply water to the seat of fire, use ammoniacal liquor or other chemical fluid.
(16) Remove and carbonize the heated coal as quickly as possible.

Finally, I should advise all to carefully study the papers already referred to. Most gas-works will probably in future find it necessary to carry heavier stocks of coal, and, if so, increased precautions must be observed when stacking, whether it be screened or unscreened coals or slacks.

In conclusion, I desire to express my indebtedness to all those who have answered my numerous queries, as recorded in the Appendices, and particularly to the colliery agents for many valuable suggestions; also to "Almea," Mr. E. A. Harman, and others.

for the wholesale manner in which I have made use of their researches.

APPENDIX I.—Extracts from Correspondence with Colliery Agents.

(1) In our view, the coal raised in April and May would not be so much higher in temperature than usual as to affect any heating. We find that it very quickly approximates to the temperature on the surface, and by the time it is delivered to the works and been handled three or four times it would be practically at a normal temperature. You will, however, probably remember that about the months you name this year the temperature was exceptionally high; and our experience is that when coal is stacked during hot and sunny weather it is more liable to fire. In any case, the coal should not be stacked very high, and we usually limit the height of our stocks to about 14 or 15 feet. With all respect, we do not think that the stoppage would have any material effect in regard to absorbing oxygen.

(2) In slacks from this district (Wigan), you will get very considerable fine dust, and I may say that deep Arley is known to contain a large amount of pyrites; and this being so, you can quite understand that spontaneous combustion must take place.

I may say here, briefly, that the Wigan district is now so well honeycombed that coal is being very much crushed by the weight of roof coming on in such a large area; and seeing that it is one of the oldest coalfields in the country, it cannot be wondered at.

(3) The recent strike would have no effect on the liability of coal to fire when stacked. The general opinion appears to be that it is chiefly a question of ventilation, as large coal is much less liable to fire than small. Very often, when small coal is put down, ventilating pipes are introduced. Where a road is made over stocked coal, if spontaneous combustion takes place, it is most likely to be beneath the road where the coal is subjected to the greatest pressure. We think the wet season has had more to do with the abnormal number of these fires which have taken place recently than anything else.

(4) Freshly-wrought coal will absorb oxygen quicker than coal exposed, or raised some time ago. Whenever we put any coal down, we do it gradually rather than in large quantities at a time.

(5) April and May coal would not be higher in temperature. The faces would cool during the strike, and the gas would draw off somewhat and oxygen replace it. It is better to tip in thin layers. It may be that the stacks were tipped or made too thick and too quickly. Also the wet summer may have had something to do with the fires being more numerous, combined with the quick tipping. Freshly-wrought coal would absorb oxygen quicker, or, in other words, it would oxidize more quickly. Then the question of mixing coals from different collieries may have some effect. All these things together may easily account for spontaneous ignition, and it goes on at some pits below ground in the goaf called "gob-fires."

(6) In our opinion, the few weeks stoppage in the mines would not materially affect the condition of the fuel as to any liability to fire the stock. The coal faces in the mines would still be solid when gotten, or very little disturbed in the bulk; any exposure to air along such faces would only apply to the faces or surface of the coal. The slack portion would be in the solid until gotten. It would not be lying open as slack in the pits.

We should rather look for an explanation of spontaneous combustion to overstacking at gas-works—the height and bulk. Was there not a natural tendency at gas-works, in view of the threatened stoppage, to stock up too closely in bulk and height?

We suggest there may have been lack of ventilation. We enclose sketch of a method of ventilation found useful in stocking slack at our collieries. We think 11 feet is high enough for any heaps of slack. We use wooden pipes, as shown on sketch, made of rough timber 1 inch thick.

(7) I think there is no question about it that the coal raised in April and May would be of no higher temperature than usual in the pits, because the ventilation would be fully restored before the coal was touched; and I don't think it is any question of absorbing oxygen at the face. I think you will most likely find it is owing to the excessively wet summer. There is no doubt about it that wet on a coal stack is a great assistance to spontaneous combustion.

It may also be that, in the hurry of getting the coal soon after the strike, less care was taken to keep it clean, and a larger percentage of objectionable pieces and pyrites have found their way into the fuel, which, of course, would absorb oxygen and be dangerous if heated.

We have stocked slack at at our own collieries during the summer without finding anything out of the usual.

(8) Although we stock very large quantities of coal, we have never experienced fire in any of our ruck of screened coal; but fires do occasionally occur in heaps of slack unless the slack is carefully watched for some time after being put down. Our practice is either to build brick ventilators in the slack rucks or else keep iron rods in the rucks and take them out every day and test the temperatures. You will doubtless be aware that coal which contains pyrites is particularly liable to spontaneous combustion.

(9) I should not consider that the coal raised in the months of April and May after the coal strike was much higher in temperature than usual; but there is strong possibility that, taking the average of pits, it would be damper than usual, and also, owing to the weight on the coal faces during the period of the stoppage, would be got smaller than usual.

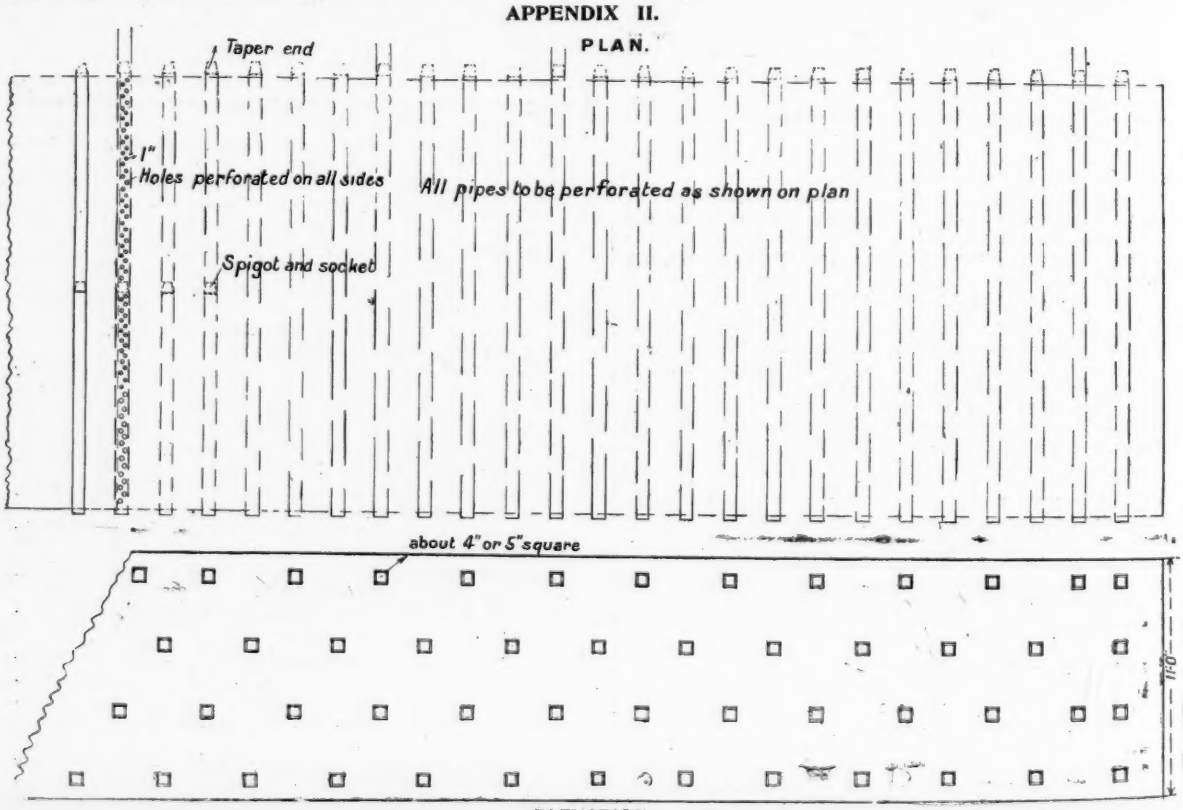
One of the chief causes of spontaneous combustion is stocking coal too thick, which creates pressure. You will no doubt appreciate that fine coal absorbs more oxygen, owing to the molecular structure of the coal being opened out.

(10) Given the same coal, it is difficult to find a reason for an increased number of what are known as spontaneous fires. Of course, freshly-wrought coal requires more careful stacking than that which has been already exposed to the air for a time. It gives off more surface gas, and some absorption of oxygen is inevitable.

The common causes of these fires are the presence of moisture and foreign matter, especially pyrites, the native heat of the coal, and the attrition consequent upon the settling down of the particles comprising the heap. The readiest illustration of this is the "gob-fire," which occurs in most collieries at one time or another.

With regard to the circumstances immediately following the 1912 strike, it is possible that some fires may have been caused through the eager and indiscriminate stacking of any kind of fuel which could be obtained. The consumer was in a hurry to get supplies, and the colliery man was in a greater hurry to send them. Coal sent out unscreened, perhaps unpicked, had most of the elements needful to start a fire. Some coals not ordinarily used for stacking—*e.g.*, South Yorks, softs, unsuitable for the purpose—would be likely materials to fire. Other materials which should not be stacked to any height are those which contain pyrites ingrained in the coal—*i.e.*, in such a combination that it cannot be cleaned off at the parting. Such coals are often soft and friable, and a comparatively small pressure is required to start them off.

APPENDIX II.



A COLLIERY'S SUGGESTION FOR COAL-STACK VENTILATION.

APPENDIX III. (Section 1).—COAL STACKED BY CONVEYORS.

Question.	Stretford.	Y.	V.	X.	AA.	BB.	Z.	G.
Class of Coal Carbonized.	Mainly Slack.	Slack.	Screened Coal.	Screened Coal and Nuts.	Nuts.	Coal, Nuts, and Slack.	Slack and Nuts.	Mainly Screened.
(1) Do you stack coals (*a*) from conveyor? (*b*) by hand?	Both	Yes No	Both	Both	Yes No	Both	Yes No	Yes ..
(2) If coals are stacked from a conveyor, do you experience trouble by the automatic sorting of the coal?	Yes	Yes	Yes	Yes	No	No	No	Yes
(*a*) the small collecting under the conveyor.	Yes	Yes	Yes	Yes	Not inside stores	..	No	No
(*b*) the large and round rolling to the bottom of the stack.	Yes	Yes	Yes	Yes	No	..	Wall built and coal thrown in middle	No
(3) Where the fine dust and very small collects, do you experience heating of the coals?	Yes	Yes	Yes	Yes, when any does occur	Yes, where the small collects outside store under conveyor	More so than in remainder of heap	No	Yes, in centre
(4) Do you take any steps to prevent the small collecting in any one place?	Yes, by digging out accumulation under conveyor	Yes	Yes	No	No	Yes, by frequently moving throw-off carriages	No	No
(5) Can you ascribe any fire as arising from the accumulation of fine coal?	Partly	Yes	Yes	Not definitely, but heating has occurred there first	Once in case of heap outside store	Yes, most fires occur in end bunker where the dust mostly collects	No	No
(6) Where coal is stacked by hand, have you experienced any of the trouble suggested by questions 2, 3, 4, and 5?	No	No	No	No	..	No	No	No
(7) When discharging coal in April and May last received immediately after the coal strike, did you notice that any was of a higher temperature or not?	Yes, but did not take records	No	No	Did not notice	Not noticed	Not noticed	Not noticed	No
(8) Do you ascribe any fires as being due to coal received at a much higher temperature than usual?	Cannot say	..	No	No	Not noticed	Not noticed	No	No
(9) Can you say why coal at that period should be of higher temperature than that received before or since?	No	..	No	No	No	..	No	..
(10) Do you receive your coals by boats or waggons?	Mainly boats	Waggons	Waggons	Mainly waggons	Both	Waggons	Waggons	Boats
(11) State carrying capacity of boats or waggons.	65 tons	10 to 12 tons	8 to 12 tons	Waggons 10 tons, boats 22 tons	Boats 80 tons	8 to 12 tons	7 tons	48 tons
(12) Any further information that may be useful for the purpose.	Coal fired this year much sooner than previously	..	Moisture, small coal, and pyrites principally cause spontaneous combustion	..	..	..	..	..

Discussion.

Mr. R. G. Shadbolt (Grantham), in opening the discussion, said the members were under a deep debt of gratitude to Mr. Kendrick, who, under the stress of illness, had contributed a paper which disclosed a great deal of application, time, and thought. Those who had read it would have some idea of the amount of work involved in the compilation, not only of the paper, but of the various tables which were included. His experience of a similar state of affairs to that narrated by the writer—and since the coal strike—was in respect to a stack of 1500 tons of coal in a building composed of three air-tight walls and a coal-wall. Of this quantity, about 400 tons were left from the old stack at the end of the strike; the remaining 1100 tons being freshly-wrought coal, trimmed on the front, and trimmed again until the proper height was attained. When the stack developed signs of heating, it was examined, and they found, in some cases, two layers of heat, less than 6 inches in depth, in various places. So they were forced to the conclusion that it was not a question of one particular spot heating up, but that the fire had, in some other way, spread itself. At the junction between the new coal and the remains of the old stock they found the fire had run to the top, and had attacked the old coal; and it was there that the actual firing of the stack commenced. The fire then seemed to "work back;" and so they had it in two different parts of the stack. Eventually they had to call in the services of the fire brigade, who by working five hours on each of four succeeding days subdued the fire sufficiently to hold it back until such time as they had pretty nearly got the coal cleared out. The last bit of the fire, when they eventually drove it into one corner, was the stiffest of the lot. It might, it was true, have been advisable to attempt to extinguish it with buckets of ammoniacal liquor; but they were faced with the difficulty that the fire was then at the bottom, and it was highly probable that the liquor, thrown from the top, would have lodged anywhere except on the place it was intended to reach. At that time they had four or five different coals, which were stacked as they arrived; but he had a shrewd suspicion that a South Yorkshire coal was the immediate cause of the heating. After narrating that he subsequently discovered similar features in an "open" stack of 400 tons to those which he found in the case of the firing of the inside stack, Mr. Shadbolt went on to speak of the general expansion of coal stacks through heating. He saw that in one case his coal so expanded that it pushed out an 11 or 12 feet stack to the extent of a couple of additional feet; so that at any rate they got extra storage facilities. Their storage capacity was now slightly increased. As to Mr. Kendrick's suggestions for the prevention and treatment of fires, he (Mr. Shadbolt) agreed with him that it was advisable to stack different seams of coal in separate heaps; and in like manner he agreed that it was necessary to stack different classes of coal separately. With regard to the stacking of fine slacks, where it could be avoided it would be advantageous; but in regard to the question of not stacking damp coals under cover, he did not see how this was to be avoided under present-day conditions. He agreed with Mr. Kendrick in the advocacy of surface ventilation only; and also with the suggestion to "mix lumps or nuts and fine" thoroughly together. Small heaps, he granted, were less dangerous than large ones. With the rest of Mr. Kendrick's conclusions—relating to the necessity of avoiding external sources of heat, avoiding leaking roofs, gutters, or pipes, and recording temperatures of coals as received, as well as of those in stock—he agreed. They were very valuable suggestions to the profession to which they belonged. His (Mr. Shadbolt's) experience also led him to believe in the wisdom of not applying water to the seat of fire, but to use ammoniacal liquor or some other chemical fluid. The paper would enable the members to do a

APPENDIX III. (Section 2).—COAL STACKED BY GRABS AND DOWN TIPS.

Question.	B.	C.	F.	K.	M.	R.	S.
Class of Coal Carbonized.	Slack and Cannel.	Slack and Nuts.	Slack.	Unscreened.	Mainly Unscreened.	Screened.	Screened.
(1) Do you stack coals (*a*) from conveyor? (*b*) by hand?	Hand direct from waggons on overhead railway	By gravity from carts	Tipped down inclined shoots by hand	Tipped from carts	Chiefly by gravity from carts	Stacked by grab then wheeled to position and hand stacked when necessary	Hand, and direct from waggons
(2) If coals are stacked from a conveyor, do you experience trouble by the automatic sorting of the coal? (*a*) the small collecting under the conveyor. (*b*) the large and round rolling to the bottom of the stack.	..	..	.. Small settles in heaps, large runs to bottom	..	..	No. No conveyors used. Always occurs	..
(3) Where the fine dust and very small collects, do you experience heating of the coals?	Heating up invariably commenced in slack	Yes	No	Cannot say definitely	..	No	No
(4) Do you take any steps to prevent the small collecting in any one place?	No	Try to blend the coal to avoid small collecting in one place	No	No	No	No	By judicious tipping
(5) Can you ascribe any fire as arising from the accumulation of fine coal?	No	Yes, in most cases	No	No	No	No	No
(6) Where coal is stacked by hand, have you experienced any of the trouble suggested by questions 2, 3, 4, and 5?	No	No	..	No	No	No	No
(7) When discharging coal in April and May last received immediately after the coal strike, did you notice that any was of a higher temperature or not?	Not noticed	Not noticed	Not noticed	No	No	No	No
(8) Do you ascribe any fires as being due to coal received at a much higher temperature than usual?	No	Coal received after strike on fire now	No	No	No	No	..
(9) Can you say why coal at that period should be of higher temperature than that received before or since?	If so, might it not be due to coal being exposed in pit during strike	Oxidation of pyrites started owing to stoppage and hot air ventilation in pit	No	No	Not noticed	No	No
(10) Do you receive your coals by boats or waggons?	Waggons	Waggons	Waggons	Waggons	Waggons	Both	Waggons
(11) State carrying capacity of boats or waggons.	8 tons	10 tons	7 to 10 tons	10 tons	10 to 12 tons	Boats 60 tons, Waggons 9 tons	7 to 10 tons
(12) Any further information that may be useful to the purpose.	Dividing up coal-stores by cross walls to isolate any heating that may occur	One fire caused by radiation through wall, where hot ashes tipped. Coal fired this year much sooner than previous years	Fires sometimes due to oily waste buried in coal. Coals won from greater depths higher temperature. Fire in slack this year after three months, not had one previously	Keep pyrites as low as possible	..	Only stack screened coal free from pyrites	..

great deal to minimize the risk of heating and firing—a state of things which, when it happened, not only involved great losses, but carried in its train demoralization and dislocation, besides inconvenience to the community. If by the reading and discussion of Mr. Kendrick's valuable paper they could eradicate, or even minimize, these dangers, the profession would assuredly be placed in a better position.

Mr. J. W. Morrison (Sheffield) said that while he approved of Mr. Kendrick's third and fourth conclusions—relating to the non-stacking of fine slacks and the non-stacking of damp coals under cover—he disagreed with him on some of the others. In regard to the question of the piling of coal, at Sheffield their largest stack would contain about 35,000 tons; and it was piled up to 35 feet. They took good care not to put in the stack anything but their screened coal; and, with one exception, there had been no outbreak of fire in fourteen years. This fire was due to taking coal direct from the pit's mouth in the morning, and stacking it the same afternoon. When they came to investigate matters, they discovered that the coal was "warm" when received, and it was appreciably so to the hand. He had had trouble at the Grimesthorpe works through leaky corrugated roofs; and he was of Mr. Kendrick's opinion that this was a point which required careful watching. Mr. Shadbolt had said that he agreed with the author of the paper as to stacking in separate heaps different seams of coal, and the stacking of different classes of coal separately. But he (Mr. Morrison) ventured the opinion that there was no necessity for this. With regard to Mr. Kendrick's suggestion: "When the temperature of the stack rises to 90° or 100° Fahr., remove top layers and watch carefully," his (Mr. Morrison's) advice would be that if they had any suspicions of heating coal they should "go" for it at once, because every moment was valuable as soon as the discovery was made. The speaker concluded by paying a tribute to Mr. Kendrick for his thoughtful paper.

Mr. J. P. Leather (Burnley) said that for a great number of years they only stocked one class of coal—local coal, and almost entirely from one seam. Sometimes it was screened, sometimes unscreened. They had never had any trouble with it for a long time, though they had stocked local coal regularly for thirty or forty years; its height varying from 11 to 18 feet, and its depth from 30 to 35 feet. Their coal was, of course, freshly broken; having only to come about two miles from the colliery; so that their conditions were about as favourable as could be conceived. For many years, as he had said, they went on without trouble; but this commenced about two years ago, and they had a great deal of difficulty to get at the actual spot where the fire was. Air had reached the centre of the heaps; and it was there that they found the hottest seat of fire—about 8 feet from the bottom of the coal. Mr. Kendrick had referred to his experiences with wet or damp coal; and they occasionally seemed to be contradictory. This was his own experience. He thought Mr. Kendrick deserved their hearty thanks for the trouble he had taken in collecting the information set forth in his paper, and for drawing the attention of the members to a question which they had discussed with so much profit to themselves.

APPENDIX III. (Section 3).—COAL STACKED BY HAND.

Question.	A.	E.	H.	J.	O.	P.	T.	U.	W.	DD.
Class of Coal Carbonized.	All Qualities.	Slack and Nuts.	Screened and Unscreened.	Mainly Screened.	Screened.	Screened.	Screened and Nuts.	Screened.	Slack and Screened.	All Qualities.
(1) Do you stack coals— (*a*) from conveyor? (*b*) by hand?	Hand	Hand	Hand	Hand	Hand	Hand	Hand	Hand	Hand	Hand
(2) If coals are stacked from a conveyor, do you experience trouble by the automatic sorting of the coal? (*a*) the small collecting under the conveyor. (*b*) the large and round rolling to the bottom of the stack.	..	..	..	..	..	..	..	..	..	No
(3) Where the fine dust and very small collect, do you experience heating of the coals?	..	Have noticed incurred temperature	..	..	No	..	No	..	..	No
4) Do you take any steps to prevent the small collecting in any one place?	..	Never stock slacks	..	No	No	Does not occur in hand stacking	No	..	..	No
(5) Can you ascribe any fire as arising from the accumulation of fine coal?	No experience	No	..	No	No	One fire probably due to this	Two fires at one works	..	..	No
(6) Where coal is stacked by hand, have you experienced any of the trouble suggested by questions 2, 3, 4, and 5?	No	..	No	No	No	No	No	No	No	No
(7) When discharging coal in April and May last received immediately after the coal strike, did you notice that any was of a higher temperature or not?	No	No	No	No	No	Not noticed	No	No	No	No
(8) Do you ascribe any fires as being due to coal received at a much higher temperature than usual?	Nothing to suggest this	No fires	No fires	No	No	No	No	No	No fires	No
(9) Can you say why coal at that period should be of higher temperature than that received before or since?	If this is so, suggest coal being rushed out before it had time to cool	No	..	..	No	No	No	No	..	Might be due to coal being fresh wrought
(10) Do you receive your coals by boats or waggons?	Waggons	Waggons	Waggons	Waggons	Waggons	Waggons	Waggons	Waggons and boats	Waggons	Carts and waggons
(11) State carrying capacity of boats or waggons.	8 to 12 tons	8 to 10 tons	8 to 10 tons	8 to 10 tons	7 to 11 tons	8 to 10 tons	12 tons	Waggons 8 to 9 tons, boats 100 tons	10 tons	7 to 10 tons
(12) Any further information that may be useful to the purpose.	..	Highest variation in coal received 12° Fahr.	..	..	..	No fires in recently stacked coal. Trouble always arisen from coal which has been in stock some months	Have found small and water where coal fires have started	..	..	..

Mr. E. ALLEN (Liverpool) said he believed their immunity from trouble was due to the fact that they stacked their coal by hand. He was of opinion that to deposit it by means of conveyors was a method likely to conduce to firing.

The PRESIDENT at this stage pointed out that their time was exhausted, and that further discussion of the subject would be impossible. If the members desired it, the Hon. Secretary would, he said, dispatch a telegram to Mr. Kendrick, thanking him for his excellent paper, which had produced so many profitable remarks. He was sure he could add that the members wished him a speedy restoration to health.

The suggestion was agreed to unanimously.

A German Gas-Meter Union.

At a recent meeting in Berlin, the gas-meter manufacturers resolved to form a combine among themselves, and appointed at the same time their first Committee. There are already thirty-one members, and all firms of any importance are included in the list. The first business taken in hand was the limiting of the guarantees which undue competition had been forcing some manufacturers to give. A circular was promptly issued to all the German customers of the trade, which stated that in all cases a five years' guarantee would be given with the goods sold, and repairs due to faulty material or workmanship would within that period be carried out free of cost. On the other hand, no member of the ring was entitled to extend the guarantee over a longer period. It further remarked that the members had only come to this arrangement in order to protect their own interests, and would not use their influence to impose unfair conditions on their customers, but would rather devote considerable attention to improvements in the goods they produced. It is understood that other measures for the amelioration of the conditions of the industry are under consideration, to be brought up at a meeting which it is proposed to hold early this month.

London and Southern District Junior Gas Association.—Next Saturday afternoon the members of this Association will pay a visit to the Edmonton works of Messrs. Thomas Glover and Co., Limited, and R. & A. Main, Limited; and a visit of the members of the Junior Institution of Engineers has been arranged for the same day. On Friday evening of next week, there will be a business meeting at the Westminster Technical Institute, at which Mr. W. H. Vanner (of the Walton and Weybridge Gas Company) will read a paper entitled "Notes on the Enlargement of a Gasholder;" and after this it is hoped to have a discussion on points raised in Mr. Winslow's recent Presidential Address.

APPENDIX IV. (Section 1).—WORKS MAINLY CARBONIZING SLACK.

Question.	Stretford.	A.	B.	C.	D.	E.	F.	Y.	Z.	BB.	DD.
(1) Have you been subject to fires in stocked coal or slack?	Yes	Yes	Yes, in new coals, now heating in three places	Yes, in unscreened coal and slack	Occasionally in slack	No	Rarely	Yes	One only	Yes	No
(2) If so, can you say how these originated?	Generally spontaneous combustion, once from steam pipe	Spontaneous combustion	Spontaneous combustion	Spontaneous combustion	Spontaneous combustion	..	Wet slack	Stacked too thick, insufficient time allowed for cooling	Hot coal from R.H. thrown in stock	Spontaneous combustion	..
(3) Coal Carbonized— Slack Unscreened coal Screened coal and nuts	Fine slack . . . 15 per cent. Rough ,, . . . 67 ,, ,, S. coal and nuts . 18 ,, ,,	All qualities	Slack and cannel	Slack 75 per cent. Nuts 25 per cent.	Slack 92½ per cent. Uns. coal 7½ per cent.	Slack 45 per cent. Uns. coal 15 per cent. Nuts, 30 per cent.	All slack	All slack	Slack Arley and nuts	30 per cent. slack. 70 per cent. unscreened coal and nuts	One-third each unscreened slack and nuts
(4) Size of screens through which slack is passed at colliery?	Fine slack ⅜ in. Rough ,, 1 in.	Various	¾ in. to 1 in.	..	¾ in.	½ in.	⅜ in. to 1¾ in.	1½ in.	1¼ in.	Various	1½ in.
(5) Coal Storage— In covered sheds In open	All in covered sheds	Half under cover Half open	Both	Covered	Covered	Both	Covered generally Part in open	Covered	Both	Both	Covered
(6) Is pyrites present in the coals, and in excessive quantities?	In about 50 per cent. of the slacks, but not in excessive quantities.	Yes	Yes, but not in excess	Yes, but not in excess	No	Yes, but in small quantities	Yes, but not in excess	Yes, not in excess	Yes, not in excess	Yes, not in excess	Not in appreciable quantities
(7) Are slacks and unscreened coals very dusty?	Half the slack is very dusty	Yes, and more liable to fire than cleaner coals	Yes, mostly Arley slack	No	Yes	No	Contains dust	Yes	Fairly so	Fairly so	Yes
(8) Are slacks and unscreened coals higher than atmospheric temperature when received at works?	Only noticed this was so on resumption of deliveries at end of coal strike in April. Not so marked now, but some slacks are still higher than atmosphere	Sometimes, depending on weather condition	Not tested	Normal	No	No	Yes, about 10° Fahr. atmosphere in waggons	3° to 5° Fahr. higher	No	Noticed coal higher than atmosphere when unloaded direct from pit	Not tested
(9) Are damp slacks and unscreened coals put to stock?	Only when absolutely unavoidable	Yes	Yes. One lot very wet where fire started	Try to avoid stocking when damp	Slack, no Uns. coal, yes	Yes	Stack in dry weather only	No slack stocked over 2 to 3 per cent. moisture	Yes	Not slack, unscreened not to any extent	Not slack, stack washed nuts
(10) Are fine slacks put to stock?	No	Decided in future to only stock purer qualities	Yes	Not generally	Yes	As little as possible	Yes	Yes	Not used	No	..
11) Are slacks and screened coals and nuts stacked together or separately?	Generally separately, but in one shed screened coal has been stacked at one end and slack at the other	Yes, if all are clean	Only use slack	Slacks and unscreened coals mixed	Stacked together	Unscreened coal and nuts stacked together. Slack only stacked if unavoidable	..	..	Together	Nuts and screened together	Together
(12) If so, have you noticed any increase in temperature at junction of the two classes of coals?	Yes, it is at this point the fire was found when emptying the shed affected	No	..	Only noticed increased temperature where rain falls in coal stock	Not noticed	Not noticed	..	..	No	Not noted	..

(13) Do you find very fine coal or that containing pyrites more likely to heat?	Very fine coal much more liable than pyrites	Both will cause firing, but fine coal worst	Dusty coal, seldom had trouble with screened coal	Fine coal always most liable	Greater danger with fine slack	Fine coal more liable	Pyrites and moisture most likely cause fire	..	Cannot say	Fine coal	..
(14) Have you had trouble with screened coals or nuts heating?	Only once, when damp coal had to be put into stock	Only when pyrites present	Not often	No	No	No	..	..	No	No	No
(15) Do you test your coal stocks regularly for increase in temperatures?	Yes, we place W.I. tubes in all our stacks and take temperatures regularly	Only by general observation	Yes, daily	Not regularly; just commenced to take daily reading	No	No	No	Yes	Occasionally, commencing regularly	Yes	No
(16) What height do you usually stack coals?	1. 24 feet 2. 20 feet 3. 15 feet	12 feet	12 to 13 feet	14 feet	10 to 15 feet	15 to 20 feet	16 to 18 feet	8 feet allowed to cool, then to 15 to 20 feet	18 to 20 feet	Greatest height 40 feet, average 20 feet	14 feet
(17) Do you stack in large heaps or subdivide so as to enable you to deal with fires should they arise?	Fill sheds right up in one large stack each	In large heaps	Long heaps 24 feet wide	Large stacks, almost divided	Large stacks	Large stacks	Large stacks	Subdivide into 1000 ton bunkers	900 tons in each heap	Large heaps	600 tons
(18) Do you provide any means of ventilating the stocks of coal or slack?	No, think it would only assist a fire	No, it is objectionable; would rather plaster up top of stack	Discontinued ventilation	Yes, with wood shafts 10 in. square	No	No	No, found they caused fires	No	No	Yes, when under cover	No
(19) Do you empty all sheds periodically, or leave stacks indefinitely?	Have left them indefinitely if not required	Indefinitely	Indefinitely	Indefinitely	Indefinitely	Indefinitely; stacks used as quickly as possible	Periodically	Left for several years; intend putting down underground conveyor to take coals from bottom of stacks	Every year	No, work off in order of stocking if in open	No
(20) Any other information that would be useful in arriving at a conclusion?	..	Stocking under water best remedy	Suggest finding out if all coals are equally liable to heat up	Would divide stacks up where possible into heaps not exceeding 500 tons	..	..	If slack kept dry it would not fire	..	Freedom from fires depends on distribution of rough coal among the slack	Coal tipped from height or in compact mass more liable to fire. Small coal should be stacked as slowly as possible	..

GUARANTEE TESTS OF THE QUALITY OF COAL.

An article by Herr O. Binder, of Wiesbaden, on the question of the control of the quality of consignments of coal by means of calorimetric and other tests has appeared in a recent issue of the "Chemiker Zeitung." The author points out that objection has been raised to the control of purchases of coal solely by calorific value on the ground that other characteristics of the coal are of importance. Broadly, coals may be divided into "caking" and "non-caking;" and naturally a coke-oven works would refuse deliveries of coal from a pit which had hitherto supplied caking coal if, owing to the caking coal being worked-out, non-caking coal was raised. But elementary analyses of samples of coal taken over a series of years from deliveries from the same pit, showed practically no change in the composition or character of the coal raised, apart from variations in the proportions of ash and moisture. For practical purposes, an elementary analysis is superfluous—a coking test is sufficient. The appearance of the cake of coke, and the proportion of coke to the dry and ash-free coal, suffice to establish identity of the samples of the coal. The ash also is distinctive in appearance and character; and an analysis of it would rarely be necessary. In brown coals or lignites, great variations in the content of moisture may occur.

The effect of storage and weathering on coal is, Herr Binder says, often exaggerated. Laboratory tests of the absorption of oxygen by finely-divided coal do not prove that similar absorption occurs with lumps or even smalls, as the state of division is widely different. The deterioration alleged to occur through weathering is probably in large measure really an effect of improper sampling. Some English and American journals have been advocating storage of coal under water; but the analytical evidence in favour of this is, in the author's opinion, very weak and unreliable. Sampling must be carried out for routine analyses in a simple manner, in order to avoid expense; but the value, at the price paid for coal, of (say) 3 per cent. of ash more or less is ample to pay for an adequate analysis on consignments of 100 tons. For regular control of deliveries of coal, it is sufficient to determine the moisture, ash, and yield of coke. If the coal is air-dried, the moisture determination can be dispensed with (except with brown coal), as the proportion of moisture will be practically constant. The analyst's report should, however, include a sketch of the cake of coke obtained by him. If this differs markedly from that of the reference sample, it may be inferred that the coal is not of the same origin.

The author concludes that coal can be properly bought on the basis of the following valuation analysis: Determination of the calorific power, which is of primary significance for all uses of the coal, supplemented by a coking test. With proper sampling the results are trustworthy, and well repay the cost of the analysis.

Masonic.—At the regular meeting of the "Evening Star Lodge," No. 1719, held at the Freemasons' Hall, last Wednesday, Bro. W. Edgar, of Hammersmith, was elected W.M. for 1913, in succession to W. Bro. C. W. Offord; and W. Bro. Thomas Cash, P.M., L.Rk., was re-elected Treasurer of the lodge.

APPENDIX IV. (Section 2).—WORKS MAINLY CARBONIZING UNSCREENED COAL.

Question.	G.	H.	J.	K.	L.	M.
(1) Have you been subject to fires in stocked coal or slack?	Yes, during last two years	No	No	At intervals	Yes, with unscreened coals	No
(2) If so, can you say how these originated?	Spontaneous combustion from damp, soft coal containing pyrites	..	..	Presumably spontaneous combustion	Spontaneous combustion	..
(3) Coal Carbonized— Slack. Unscreened coal. Screened coal and nuts.	Screened and unscreened coals and small coals, all broken before stacking	Through and through South Yorks. Screened Lancs. Screened North Wales	Slack 5 per cent. Unscreened coal, 10 per cent.; screened, 85 per cent.	Unscreened coal	Unscreened Newcastle coals	Slack, 33 per cent. Unscreened coal, 67 per cent.
(4) Size of screens through which slack is passed at colliery?	..	..	1 in.	..	..	..
(5) Coal Storage— In covered sheds? In open?	Covered	Covered	Both	Both, but no difference realized in cases of fire	Covered	Both
(6) Is pyrites present in the coals, and in excessive quantities?	Total sulphur 2 to 2½ per cent. Soft coal contains more than average	Yes, North Wales. Very little Lancs. and Yorks.	No	Yes, not in excess	..	Yes, only moderate; varies according to coals
(7) Are slacks and unscreened coals very dusty?	No	Yes	Clean	Contains dust	Yes	Sometimes
(8) Are slacks and unscreened coals higher than atmospheric temperature when received at works?	Not tested, but have no reason to think so	Not tested, should say not	No	Not tested, say not	No	Sometimes above, sometimes below
(9) Are damp slacks and unscreened coals put to stock?	Yes	No	Not if it can be avoided	Put to stock in all weathers	No	Slack no. Unscreened coal sometimes
(10) Are fine slacks put to stock?	..	..	No	..	No	No
(11) Are slacks and screened coals and nuts stocked together or separately?	All kinds stacked together	Together, but only for brief periods	Separately	..	No	Stack unscreened coal only
(12) If so, have you noticed any increase in temperature at junction of the two classes of coals?	..	No	Had increased temperature at centre of stack	..	No	..
(13) Do you find very fine coal or that containing pyrites more likely to heat?	Damp coal containing pyrites very liable to heat	Have never known heating to take place	Not noticed	Not determined	Fine coal most liable to heat	Not tested
(14) Have you had trouble with screened coals or nuts heating?	No	No	Very little	No	..	No
(15) Do you test your coal stocks regularly for increase in temperatures?	No	No	No	No	..	No
(16) What height do you usually stack coals?	20 to 35 feet	10 to 12 feet	10 to 20 feet	16 feet	23 ft.	12 to 24 feet
(17) Do you stack in large heaps or subdivide so as to enable you to deal with fires should they arise?	Large stacks	Generally heaps 200 to 300 tons	In large heaps	Large stacks	Large stacks	Large stacks
(18) Do you provide any means of ventilating the stacks of coal or slack?	No	No, the less ventilation the better	No	No. Ventilation disastrous	No	Yes, slight
(19) Do you empty all sheds periodically, or leave stacks indefinitely?	No special rule. Coal in stock years, given no trouble	Indefinitely	Periodically	Indefinitely	Every year, as every shed fired during every winter	Indefinitely
(20) Any other information that would be useful in arriving at a conclusion?	Refrain from mixing suspected coals with others	..	..	Only certain cure for some coals is to store under water	..	..

PREVENTING THE SPONTANEOUS COMBUSTION OF COAL.

In the "Zeitschrift für die gesamte Kälte-Industrie," there has appeared an article on this subject by Herr O. Binder, of Wiesbaden, in which he points out that the old view on the spontaneous ignition of coal was that it was due to the oxidation of the pyrites contained in it. This view is scarcely tenable, because the coals most subject to spontaneous combustion are not always those which contain the most sulphur, and even the instantaneous combustion of 1 per cent. of sulphur would raise the temperature of the coal by only about 135° Fahr. The combustion of the sulphur must, however, be spread over a comparatively long time, and spontaneous combustion of the coal could not be set up thereby. Spontaneous combustion, moreover, occurs only in the interior of a stack of coal, and only in small coal where access of air is restricted. Other views are that spontaneous combustion is due to the absorption of oxygen by the coal.

Laboratory experiments have shown that coal may take up as much as 4 per cent. of oxygen under favourable conditions. This theory was formulated mainly from experiences with very finely-divided fresh wood charcoal, which has quite a different structure and porosity from coal. Finally, spontaneous ignition may be regarded as due to the continuous decomposition and change in the coal, which is accelerated by its release from the pressure to which it was subjected from the material overlying the coal seam. The gas which results from the first stages of the decomposition of coal is marsh gas; and this may form an explosive mixture in the space above the heap of coal. Ventilation of the coal-store will prevent the accumulation of large quantities of marsh gas above the coal; but ventilation of the coal heap may only quicken the heating of the coal, and set up spontaneous combustion, with the result that larger volumes of marsh gas will be produced. Herr Binder proposes to ensure the prevention of spontaneous combustion in coal bunkers, &c., by running a system of pipes, through which cold brine is circulated, through the bunkers, with a view to preventing the temperature of the coal in store rising to any considerable extent.

Mr. Henry L. P. Allender, who has been associated with the Torbay Paint Company for the past thirty years, has been admitted into partnership, as from the 14th of October last, in consequence of the death of Mr. Freeman Burrows. The partners in the firm now are—Mr. Edward Stevens, Mr. Spencer Freeman Burrows, and Mr. Allender.

APPENDIX IV. (Section 3).—WORKS MAINLY CARBONIZING SCREENED COAL.

Question.	O.	P.	R.	S.	T.	U.	V.	W.	X.	AA.
(1) Have you been subject to fires in stocked coal or slack?	No	Three occasions in 15 years	No, with one exception in 40 years	No	Rarely	No	In covered sheds, not when stacked in open	No	Yes	No
(2) If so, can you say how these originated?	No	No, but think one by heat radiated from retort stack	Spontaneous combustion due to wet coal	..	No	..	Moisture from roof; and steam-pipes acting on pyrites	..	..	..
(3) COAL CARBONIZED—Slack, Unscreened coal, or Screened coal and nuts	Principally screened coal	Screened coal and nuts	Screened over ¾ in.	Yes	Screened coal and nuts	Screened coal	Screened coal stack by conveyor	Screened coal 50 per cent.; nuts and slack 50 per cent.	Screened coal and nuts	Principally nuts
(4) Size of screens through which slack is passed at colliery?	..	..	Not used	..	..	..	..	1½ in.	..	..
(5) COAL STORAGE— In covered sheds In open	Covered	Covered	Open	Both	Covered	Both	Both	Both	Covered	Covered
(6) Is pyrites present in the coals, and in excessive quantities?	Only slight traces	Yes, but not in excess	Not to excess	No	Yes, but not in excess	No	Yes, but not in excess	Yes, but not in excess	..	Relatively free
(7) Are slacks and unscreened coals very dusty?	..	..	Not used	No	..	..	..	Slack dusty	..	..
(8) Are slacks and unscreened coals higher than atmospheric temperature when received at works?	Not tested	..	..	Not tested	..	..	..	Not tested	..	Not more than 1°
(9) Are damp slacks and unscreened coals put to stock?	..	..	..	Yes	..	No	No	No	..	Stores as received
(10) Are fine slacks put to stock?	..	..	..	No	..	No	No	No	..	..
(11) Are slacks and screened coals and nuts stocked together or apart?	..	..	..	Separately	..	No	Coal and nuts together	Stock screened coal only	Screened coal and nuts only	Yes, when received
(12) If so, have you noticed any increase in temperature at junction of the two classes of coals?	..	..	..	..	..	..	No	..	..	No data
(13) Is very fine coal or that containing pyrites more likely to heat?	..	Fine coal dust most liable	..	..	..	..	Not noted	..	..	No data
(14) Have you had trouble with screened coals or nuts heating?	No	Yes	..	No	Occasionally	No	Yes, but afterwards cooled without special treatment	No	Yes	No
(15) Do you test stocks regularly for increase in temperatures?	No	No	No	No	No	No	Yes	Not regularly	Yes	Occasionally
(16) What height do you stack coals?	14 to 30 feet	20 to 22 feet	20 to 40 feet	16 to 18 feet	16 feet	About 12 feet	20 feet	10 to 15 feet	20 to 25 feet	20 to 21 feet
(17) Do you stack in large heaps or subdivide so as to enable you to deal with fires should they arise?	Large stacks, no subdivision	Large stacks, no subdivision	Large stacks	Large heaps	Large stacks	Large stacks	Large heaps, sheds built to permit isolation in case of fire	Large heaps	Large heaps	Large heaps
(18) Do you provide means of ventilating the stocks of coal or slack?	No	No	No	No	No	No	No	..	Yes, wooden shafts	Vertical tubes, now discarded
(19) Do you empty all sheds periodically, or leave stacks indefinitely?	Periodically	Indefinitely	Leave as much undisturbed as possible	About every two years	Indefinitely	Indefinitely	Indefinitely	..	Machine sheds periodically. Hand stacked indefinitely	Practically once a year through necessity
(20) Any other information that would be useful in arriving at a conclusion.	..	..	Coal in stock should be as large and dry as possible, and free from pyrites	..	..	Only selected screened coals should be stacked, and not more than 12 ft. high	..	..	..	..

THE WOODALL-DUCKHAM VERTICAL RETORTS FOR BIRMINGHAM.

In an article appearing last Thursday, the "Birmingham Daily Post" made the following remarks with regard to the installation of Woodall-Duckham vertical retorts now being completed at the Windsor Street gas-works.

The installation of new retorts at the Windsor Street gas-works, which was authorized by the Birmingham City Council several months ago, is rapidly approaching completion; and the Gas Committee hope the whole of the work will be finished by the end of the year. It is about thirty years since the horizontal retorts were erected at Windsor Street by Mr. Charles Hunt; and they have served their purpose well. Now, however, they are worn out; and as great improvements have been made in the plant for the manufacture of gas, the Committee decided to replace them by the best and most np-to-date system it was possible to secure. After considering the subject from every point of view, they accepted the tender of the Woodall-Duckham Company, of Westminster, for the construction of 22 beds of their vertical retorts, each bed containing four retorts. The contract price was about £60,000. The system adopted is regarded as the most economical which could have been selected, both in respect to the cost of production of gas and the quantities and values of the various residual products obtained. One advantage of the vertical retort over horizontal plant is that the coal will be lifted to the top of the retort-house by big elevators, and then dropped into the retorts; the rate of discharging the coke at the bottom being regulated by machinery. The new method, too, will reduce to a minimum the smoke and steam emitted in the manufacture, and the output of gas will be double the quantity originally obtained. As the retorts are finished, they are set to work; and so far the new plant has given the greatest satisfaction. The construction of 22 beds with 88 retorts is the largest order for vertical retorts that has ever been placed by a gas undertaking.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

At a Meeting of the Scottish Junior Gas Association (Western District) on Saturday, in the Glasgow Technical College, Mr. WALTER GRAFTON read a paper on "High-Pressure Lighting." In view of the illness of Mr. F. L. MacLaren (the President), Mr. JAMES M'GHEE occupied the chair.

The CHAIRMAN pointed out that the lecturer was well known to them all. The progress of high-pressure lighting in Glasgow had, he said, been watched keenly in all parts of the country, not only within the limits of Scotland, but also over the Border. There had been two or three rather severe criticisms and disappointments expressed over high-pressure installations in parts of England. In Glasgow, they had made every endeavour to try to avoid some of the mistakes that they in the South had fallen into. The system in Glasgow was causing more interest than others; and he thought they would agree that the city, in regard to its high-pressure installation, had not been behind its Southerly neighbours.

Mr. WALTER GRAFTON (Glasgow) read the following paper:

HIGH-PRESSURE GAS LIGHTING.

Some months ago I was asked by your Council to give a paper on "High-Pressure Gas," with especial reference to Glasgow experiments. To be candid with you, I did not feel I could; but, after further pressure, I consented to give a paper bearing upon, but not wholly descriptive of, the high-pressure gas installation, and to-night I am here to deliver it, trusting that it will be of interest, and have an educative value to the members. I may say, however, that it is not my intention to criticize the installation put down by the Corporation. The subject of high-pressure gas supply is fast becoming a large one, and having many branches; but I propose to confine myself to lighting—leaving furnace and other heating applications alone—with special reference to street and shop illumination.

Somewhere I have read: "When the day is changed to night, gas is just the thing for light." In past years, such a sage saying could not have been made, because the volume of light obtainable from gas under the best possible conditions did not exceed 10 candles per cubic foot consumed. With the use of inverted mantles and a greatly increased pressure, the volume of light has so increased that night is now changed by gas into day. This is chiefly brought about by the rapid rate of burning the gas, which can only be done by having plenty of primary air, but not too much, entering the burner. The rate of flow governs the economy—shall I say?—of any result one is likely to get from an incandescent gas-burner. Too much or too little gas or air has equally a detrimental effect on the candle power that is obtainable from the mantle per cubic foot of gas employed. With district pressures of 3 inches of water, good results are now obtained from the inverted mantle; and the wonder is that we still see so many upright burners in our street-lamps. The latter are out of date, and more costly to maintain.

The rapidity of combustion, whether of gas or other substances, means increased temperature per unit area of the luminous body; and it has been shown by Lummer and Pringsheim that the volume of light emitted is proportional to the temperature to such an extent that an increase of 1 per cent. in temperature yields an increase of 12 per cent. of light. To some extent this is true. But all light is not due to high temperatures. Certain salts added to a bunsen gas-flame yield different values of light. This is seen to be the case in another way—namely, by impregnating the carbons of the electric lamp, we get the flame arc, which has a far higher efficiency than the old type of electric arc. To achieve this increase of temperature, which means consuming more gas in the same space, pressure is needed.

New plant has been designed to deal with this demand. In Glasgow, rotary compressors have been installed—one being Keith-Blackman's, and the other James Milne and Son's, and directly coupled to "National" gas-engines to raise the pressure of gas to 80 inches water-column. They have now been working daily for about nine months, with most satisfactory results. The method of use has been to divide the work equally between them, though to some extent the actual work done by each has varied, because the lamps are burning full on from lighting-up time to 11.30 p.m., when all lamps are reduced to one burner each until extinguishing time. From midnight, the other compressor is started, and runs until the morning or extinguishing time. But the work actually performed is only about one-third of that done by the plant that starts the day. The capabilities of the whole plant have never been exercised; but a day will come when more streets will have to be lighted. Then, and then only, will that ever be possible.

The compressor and engine of the Keith and Blackman plant are separate; but both are bolted-down to one concrete foundation, and are connected by a flexible coupling. The Milne compressor and engine are fixed to a cast-iron base, which is bolted to the concrete foundation. The inlet and outlet pipes are common to both plants. Inlet and outlet disc-valves are provided; and between the plants a 4-inch back-pressure valve is let in the bye-pass main to allow low-pressure gas to pass to maintain the pilot lights during the periods the plant is idle. The plant is supplied from a 6-inch main; the outlet or high-pressure main being 4-inch steel. The high-pressure main is provided with a drip-well, in which practically all oil used in the compressors is recovered, placed a short distance from the house. So far, no trouble has been experienced from oil deposits. With the exception of about 680 yards of 6-inch pipe, the whole of the high-pressure supply is of 4-inch size, and extends to about a mile and two-thirds.

Of the lamps, there are seventeen on harp columns, thirteen on swan-neck columns (four of which have raising and lowering mechanism), one harp lamp over a public convenience, twelve lamps centrally suspended, and seven lamps specially staggered on cross-street suspension—in all fifty lamps, or 137 burners. Of the first kind, they are all of one type—Keith and Blackman four 3-light and thirteen 2-light lamps. The lamps on the swan-neck columns are partly "Graetzin" and partly Welsbach "Pharos." The cross-street suspensions carry "Graetzin" and "Pharos" lamps. Over the public convenience a 3-light Keith-Blackman nominal 4500-candle power harp lamp is fixed.

The types of cross-street suspension are of interest, because of the variety. There are two of Messrs. Ehrich and Graetz's of Berlin. Gas being supplied through flexible tubing, and having traversing and lowering gear, the lamp is always subject to gas pressure, and affords a ready means of adjustment for maintenance or cleaning. These have worked well; but the sag of the pipe is thought by some people to be not very pleasing to behold in the daytime. Then there are five Keith and Blackman suspension apparatus. The gas in this case is supplied through malleable iron pipe looped up to the cable, having traversing and lowering gear for the lamp. With this apparatus, as soon as the lamp is raised, lowered, or traversed towards the ground, no gas is fed to the lamp. The pilot is lighted by means of a small spirit lamp suspended from the pilot-tube arm, and remains alight sufficiently long enough to allow time for the lamp to be replaced in its carriage. This method has not worked quite so sweetly as one would have liked. Of the Welsbach "Pharos" apparatus there are five, with mechanism embodying both lateral and vertical movements, but embracing a double-hinged malleable iron pipe to the lamp. Thus no interference with the gas supply occurs in any movements. These have worked well on the whole.

The last form of suspension is the result of a desire on the part of the General Manager to overcome defects from our point of view in the others, and be able to lower the lamp at any period of the day, and especially during the hours of lighting. No such apparatus of the magnitude needed was on the market; so I had to make and use such apparatus as could be obtained. I worked it out; and you have seen the result in seven installations. Fig. 1 shows this suspension with lamp in position and down for trimming. They are entirely a success, and in my opinion, from an architectural point of view, are better than the central suspension, while the lamps and fitting during the daylight look neat and well, and at night the lighting effect of a 12 feet staggering from the centre of the road is pleasing. They have stood successfully a very severe trial during the past week or two. The only trouble experienced (which affected the whole of the installations) was

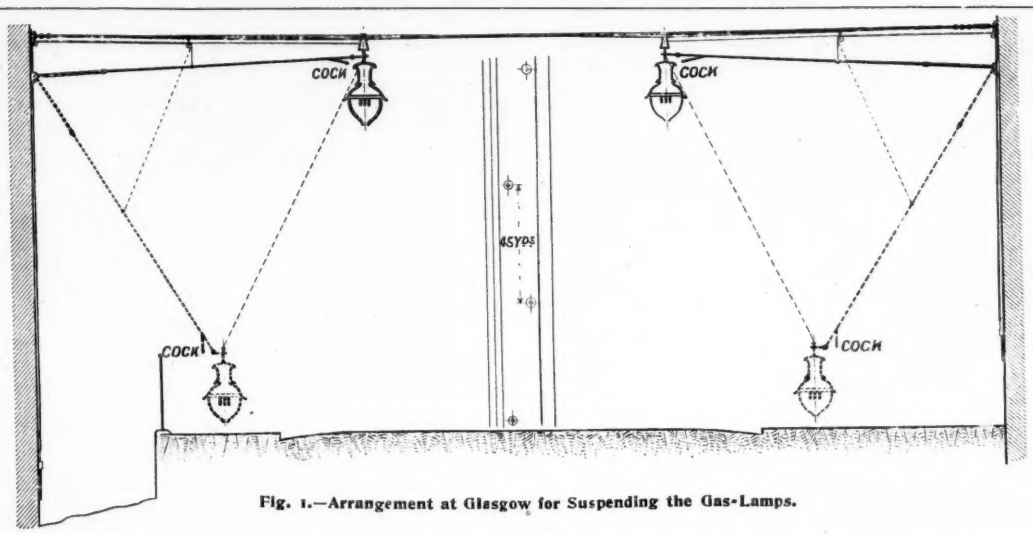


Fig. 1.—Arrangement at Glasgow for Suspending the Gas-Lamps.

the necessity for lighting up many of the pilot-flames, which were extinguished by the wind.

The Keith and Blackman lamps are in two sizes, of nominal 3000 and 4500 candle power each, and fitted with special control cocks operated by means of a rod fixed to the side of the columns. The attendant, with a special key, can turn one or two burners off at any predetermined time, leaving one burner alight. Or, again, by a further movement, the whole of the burners can be cut off. This is an essential feature; for should high-pressure gas be needed during the day time for industrial purposes, the lamps can be put into or out of use. The pilot-flame is not affected by these operations, nor is the efficiency of the one burner. The mantle is tied on to a screw-on-clay-carrier. So far we have been experimenting with many makes of mantles beside the Keith and Blackman standard one, with the result that we have obtained a fairly good article. To get good results, care and attention are needed to see that all parts of the lamp are kept scrupulously clean, and the adjustments not interfered with, though I am constrained to say equal or better results could be obtained from the use of less pressure than 80 inches by a simple alteration in the lamp. This is the only lamp of the many tried that requires 80 or 90 inches in order to get anything like good results.

Besides, as we use them, all lamps must be lighted up at one time. "The day is far spent" for a man to go to individual lamps to light or extinguish them. The charm of the electrical lamps is their oneness of operation; and unless our gas-lamps are operated in like manner, we need not enter the field of competition. I am pleased to say the Glasgow high-pressure lamps operate as one, and in consequence many people have taken them on this account for electric arcs. Now and then we find one burner (mark you, not lamp) behind the others by some minutes; and the strange thing is that the next night it will keep time with the others.

The Welsbach "Pharos" lamps are all of three-burner type in two sizes of a nominal 3000 and 4000 candle power, fitted with automatic lighters and switches. The switches are used for extinguishing two burners when needed. Most of the lamps have lever-cocks attached, to enable the attendant to extinguish one or all burners; or should the switch fail to operate, he can turn off two burners. We have one lamp fitted with a simple but reliable switch, and in this case without any lever-cocks; and the working of the switch is perfect. If all the lamps were so fitted, the attendant would not require to leave the compressor-house at all. The switches are operated by increasing the pressure about 10 inches for a few minutes. At present, nineteen of the fifty lamps are so operated. The switches have many advantages besides labour saving. They economize gas, mantles, and globes, and not the least preserve the attendant's temper. So great are these advantages to the well-being of high-pressure lighting of streets, that I hope soon to improve the installation by extending the use of switches.

The Graetzin lamps have also three burners of a nominal 4000-candle power, and are fitted with lever cocks and switches. At first these lamps worked indifferently, and in consequence had to be subject to slight, but necessary, alterations to suit the conditions imposed upon them by the other lamps. In saying this, I do not in any way condemn the lamps, but think it only right to make this statement, because they were not intended to be used with 80 inches pressure or more. These lamps usually work under a 55-inch water column; and a higher pressure simply increases the gas consumption without giving any equivalent in candle power. Producing more intense heat and more pressure on the tissue of the mantle, it shortens the life of the lamp and that of the mantles and glass globes. They are all now working satisfactorily.

To summarize the plant, there are compressors in duplicate, each different, and each independent of the other; seven methods of fixing the lamps at from 16 to 25 feet high; three kinds of lamps, or in subdivision five sizes, from which I think the results are most encouraging. Diagram 2 gives a good idea of what light is available, used, or wasted by the position in which the lamp is placed. The high-pressure lamps give a perfectly steady light, clear and brilliant.

The mantle is one of the most important factors, if not the most important, to be considered, and must always receive attention if the light is to have the required colour and penetrating power. A yellow light penetrates fog better than a white one. Then the shape and size of the mantle are also factors that must not be ignored if we expect to get anything like continuity of brilliancy with efficiency. This is especially so at the present time, where in some cities light is purchased not by so many cubic feet but as "candle power" [*vide* the "Westminster Specification"]. The importance of having good mantles is nearly everything; and "good" depends in the first place upon the nature and quality of the material used, and secondly upon the care and skill used in the making. Therefore improvements in quality must come from either of these directions. The ash of the finished mantle

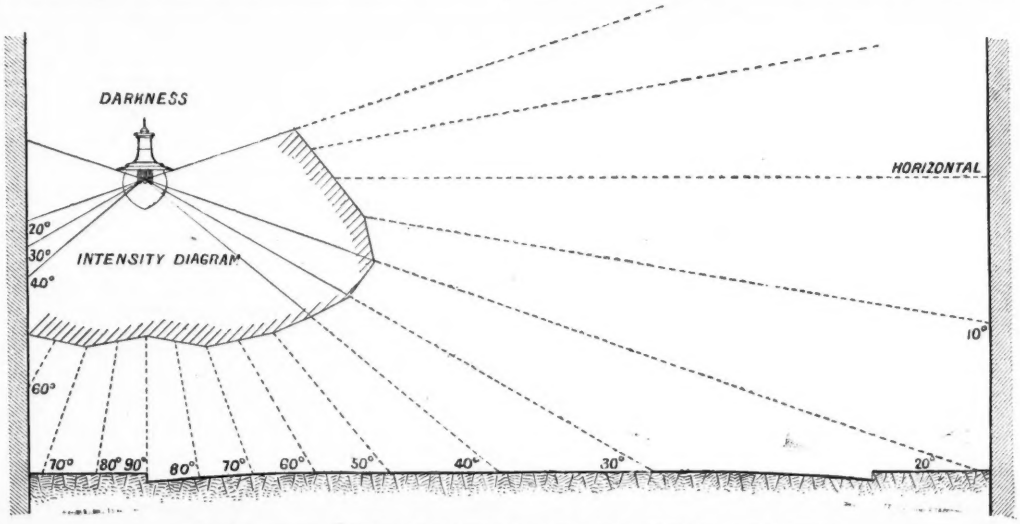


Fig. 2.—Diagram showing Light Available, Used, and Wasted in Street-Lamps.

has the same physical structure as the original fabric, whether it be artificial fibre, cotton, or ramie. Strength and other physical properties of a mantle depend greatly on the nature of the original thread. It is obvious that a uniform continuous and solid fibre will produce a like structure in the ash of the finished mantle, and that one formed of such a structure will make for increased strength. Ash is something that has no strength inherent in itself; such strength as it has being the result of the physical structure inherited from the material from which it sprang. Cotton mantles fall off in candle power, while ramie ones maintain it. But both change a little in colour to a white shade, and both shrink in use. Artificial fibre mantles maintain their candle power and colour, and do not appreciably shrink; consequently they maintain their strength to such an extent that they can be bent over without breaking.

From the foregoing it will no doubt be gathered that the best mantles have been used, and the undesirable mantles eliminated. We want only those that will give us candle-power-life, and where cost is not the only factor.

It may interest you to know that I have obtained by actual test inside, on different days, more than 60 candles per cubic foot with a certain lamp and type of mantle with Glasgow gas. The size of the mantles was 6 inches long and 1⅜ inches diameter; and the standard of comparison a 10-candle Harcourt pentane lamp.

Pressure Inches of Water.	Candle Power at 19° to the Horizontal.	Net Consumption per Hour Cubic Feet.	Efficiency per Cubic Foot.
54	4822	75	64·30
80	4465	76	59·53

From these results, it is physically impossible to obtain 60 candles per cubic foot from a ⅜-inch by 1¼-inch diameter mantle. This is only given to show that size of mantle has something to do with a result. Of course, you may try; but with the present-day best mantles it will be only labour lost to attempt it. I will therefore endeavour to give a brief account of some of the results so far obtained.

Globes and Mantles Used in Six Months per Burner.

	Life of Globes per Burner.	Life of Mantles per Burner.
Class A	One every 100 days	One every 36 days
,, B	,, ,, 235 ,,	,, ,, 29 ,,
,, C	,, ,, 1350 ,,	,, ,, 63 ,,

These lead up to costs; and before I give any, I desire to express my humble opinion that the day has now arrived for standardizing a method of comparison. Only recently I have seen in the Press experts' figures all differing, and yet all supposed to be compiled from the same data. Opinions differ, of course; and if other opinions differ from mine, it does not follow that I am wrong in seeking to amend the basis of costs. Take a case in point. One generally sees the cost of globes given as so much per lamp. I think it should be so much per burner per annum, as otherwise the large lamp is penalized unfairly. The actual cost of globes per annum for a type of lamp having (say) 1500-candle power burners may be in the proportion of—

	Per Lamp per Annum.	Per Burner per Annum.
For a lamp of one burner	90s. 0d.	90s. 0d.
,, ,, ,, ,, two burners	136 9	67 5
,, ,, ,, ,, three burners	192 0	63 0

The figure of 192s. per lamp penalizes the largest against the smallest, because, as a matter of fact, the same result, or even less, would accrue from the large lamp if only one burner had been used in the globe.

These conclusions again make one think whether it is wise or right to calculate the costs out in any haphazard fashion or per 1000 candle power. With high-pressure gas lighting of streets, there are such items as the cleaning of globes in the daytime, and the breakage of mantles resulting from this operation, either by accident or otherwise of the attendant. And yet another source of expense is mantles blown away during high winds. Fogs and sudden darkness in the daytime often require artificial light in our streets. Should all these extra costs be reckoned as legitimate "cost per lamp per annum," when, as a matter of fact, only 2000 hours constitute the year? No, gentlemen; this will not, in my opinion, do. A year is a year for street lighting; and as the lamps are used daily, and require daily attention, the total hours—viz., 8760—should be considered; and upon this basis comparison can be made in and between any towns' results. The rays of light from the moon on certain days and periods of the year, as well as little or no light during summer's longest days, all go to reduce the "cost per burner per annum." This is not unsound reasoning, though you may say it only applies to country towns. But these items reduce the lighting bill for such places; and so also would the more extended use of one high-pressure burner per lamp during the hours from about midnight to dawn in our cities. This is not a case of "per lamp," because only a portion, indirectly, of the lamp is used; therefore the right term is "per burner-hour."

Upon this new basis (*a*), I will give you the cost of lighting streets by high-pressure gas, as it should be if properly installed; everything being included, except interest and depreciation on capital.

The cost per 1000 candle power, according to the undermentioned figures, would be 0·2d. Now the actual illumination of 2,718,680 candle-hours was given to the Glasgow streets; or, in other words, for every hour of full lighting, light equal to 3312 candles, and after midnight to 1235 candles, or an average of 1940 candles was emitted per lamp—the economy being 0·0194 cubic foot per candle, or, as it is usually expressed, 51·7 candles per cubic foot. This, in reality, is far better than obtains in London. The compressing plant is only working at about one-third of its capacity.

Cost of High-Pressure Gas Lighting.

	(*a*) Per Burner-Hour. Pence.	(*b*) Per Lamp-Hour. Pence.
Gas, lighting, pilots, and power, at 1s. 6d. per 1000 cubic feet	0·08920	0·2440
Mantles, 137 burners	0·00787	0·0215
Globes, 50 lamps	0·01156	0·03168
Labour	0·03230	0·08850
Oil, waste, and repairs, &c., to compressing plant	0·00077	0·00211
Sundries for lamps, and water	0·00075	0·00206
Total	0·14245	0·38985

I will now give you another computation (comparable with (*b*)) based upon figures obtained in another city, where the total lighting hours are 3675 a year; but with this difference—that the cost of gas has been altered to 1s. 6d. per 1000 cubic feet and also the total hours per annum:

	Per Lamp-Hour. Pence.
Gas at 1s. 6d.	0·55000
Compressing	0·07050
Globes	0·00753
Mantles	0·03732
Repairs, &c.	0·00707
Manual labour	0·04110
Total	0·71352

The lamps in use have three burners, and, I am told, yield 3600 candles. Assuming that this volume of light is obtained, the cost per 1000 candle-power hours equals 0·198d., or practically the same as my estimate, but costing 83 per cent. more.

These results are most satisfactory, and would be more so if we could get a greater demand for high-pressure gas during the evening. The great task confronting us is quickly to get more gas sold, in order to reach the position at which the plant becomes too small, and extension plant, so cheap and efficient as compared with that in use, will be needed. If we can turn the corner, the stability of high-presure gas economy in Glasgow will be enormously strengthened; for we can then sell at prices relatively far lower than any of our competitors can hope to achieve.

New custom is needed; and I suggest that business firms should be solicited to avail themselves of the high-pressure light for illuminating their shops from outside at a fixed charge per burner-hour per annum, for which a high-pressure main could soon be laid. The price should include fixing lamps, gas burned, lighting and extinguishing, and cleaning and maintaining the lamps for an approximate number of hours per year. I feel convinced that, so soon as shopkeepers become aware of the many advantages offered with no trouble to themselves, a great demand will result. The lamps should be lighted at dusk; the lighting and extinguishing being undertaken by the Corporation. A scale of days and hours could be drawn up, as five or six days per week from dusk to 8 p.m., and Saturdays till 10 p.m. The modern tendency is to get away from fixed charges based on so much per 1000 feet.

The advantages of such a system are many—(1) It is easily understood, and generally accepted as fair and reasonable. (2) The light is at its best, without any risk of running up a big gas bill. (3) The shopkeeper knows what the bill will be, and that it is not subject to great variation. (4) There is no meter-rent or index-reading, except the gas be used for heating purposes. (5) The cost would be paid by fixed amounts to suit summer and winter periods or quarters.

It cannot be disputed that there are a large number of shopkeepers who have been deterred from adopting gas (low or high pressure supply) by reason of the great difficulty in actually getting the light installed and maintained. Again, the people need to be educated to the advantages of high-pressure gas lighting; and there is no better instructor, to spread the information of satisfaction, than the consumer whose business has increased by its adoption.

In conclusion, I would say that the problem is simply the common commercial one of selling. It cannot be hoped, however, to obtain satisfactory results from the publicity campaign alone. Representatives must be employed whose duty it is to get new business.

Discussion.

The CHAIRMAN, in inviting discussion, said they had heard a very interesting paper.

Mr. ALLEN thought that Mr. Grafton might have added some points. With regard to flame-temperature, from Mr. Grafton's own showing, it did not always follow that efficiency in the lighting—that was, efficiency in candle power—had gained by a rapid rate of burning. Experience had taught him, in connection with the mains, and also with the pipes in a building generally, that, while installing a high-pressure gas system, it was particularly desirable that the interior of the pipes should not be coated. As to the question of lamps, he was in hearty agreement with Mr. Grafton. But he would like to ask him why he should have used the word "switch." There was a kind of electrical feeling about the word; and he did not care for it when they had a phrase like

"automatic distance lighter." With regard to mantle sizes, he noticed Mr. Grafton gave the length as 6 inches in his successful lamp. He thought that one-half of the benefit in using an inverted mantle was that it was bound both at the top and bottom, and so made a stronger mantle. If they increased the length of the inverted mantle, they were destroying the purpose for which it was created. He was an advocate of making more mantles shorter in length.

Mr. WHITELAW thought it was very important that the composition of the gas should remain constant; pointing out the drawbacks when it was not so. Mr. Grafton gave them the case of a lamp tested at 80 inches water-column, and the same lamp tested at 54. At 80 inches he had obtained inferior results to the tests that took place at 54 inches. This showed that the lamp was adjusted for a particular pressure. The lamp tested at 80 inches was adjusted to give maximum efficiency at 54 inches. It was not doing justice to the lamp to test it at any other pressure than 54 inches. Every lamp, whether a high-pressure or a low-pressure one, had a particular pressure at which it would give maximum efficiency. Mr. Grafton's experiments had shown this very clearly. The author had advised a new method of costing, and he (Mr. Grafton) preferred the method of "per burner-hour," and based his calculations upon 8760 hours, the total hours in the year. He would like to ask him if this was really the best method of basing the cost. He would suggest that, instead of doing this, they should take out the cost in pence per lamp per burning hour.

Mr. MILNE said there were one or two points he would like to raise upon the rate of the flow of the gas or the mixture, and the effect it had upon the efficiency of light. Was not the efficiency of the lamp more controlled by the actual result in mixture, and would not the same efficiency be obtained if they could get the proper gas and air mixture at lower pressure? Were not the high pressures ruling just now for high-pressure gas a makeshift to suit the construction of the lamps as they stood at the present day? Could Mr. Grafton give them information as to the actual pressure of the mixture of gas and air at the point of combustion? He noticed there was one peculiar thing—that one burner was late in lighting in one of the lamps. Was this general in the lamps throughout, or was it confined to one make of lamp? He was inclined to agree with Mr. Allen regarding the length of the mantles. His experience had shown that when they got too long, they became unwieldy. With regard to the use of high-pressure light for shopkeepers, he thought the basis of charging so much per lamp per annum, irrespective of the cost of gas (in the hands of the Gas Department) was the best. Was the flame the author was using, in connection with the result in which he obtained 64 candles, through a sieve, or was it with a homogeneous flame through an orifice?

Mr. DAVID FULTON (the Secretary and Treasurer), who, like the other speakers, thanked Mr. Grafton heartily for coming forward with his paper, said it was an honour to the Junior Gas Association to have submitted to them the first public description of the Glasgow high-pressure street-lighting system. But he was disappointed that Mr. Grafton—seeing the paper was given to a Junior Association—should not have told them more of the simple scientific principles underlying high-pressure lighting. It had struck him, in looking at the lighting in Bath Street, that the high-pressure lamp was more pleasing to the eye than the electric arc lamp. It gave a softer light—much softer even than that secured by low-pressure lamps. Mr. Grafton's figures as to the pressures and efficiencies were very interesting. They seemed to show that there was a limit in pressure beyond which efficiencies decreased, and they were only using pressure extravagantly.

Mr. JAMES STEWART asked whether it would not be better, instead of duplicating the mains for commercial and other purposes, that the lamps should be supplied with governors, so as to enable them to use the same mains for street lighting, domestic, and commercial purposes.

Mr. T. CARMICHAEL wished to know the maximum and minimum density of the illumination.

Mr. JOHN FRASER criticized what he considered the crudity of the india-rubber tube which projected from the standard. He thought it could be run up the standard.

The CHAIRMAN, in closing the discussion, referred to the length of the mantles. Frankly, he said, while he had an open mind upon the matter, the German practice seemed to him to be tending towards the more bulbous-shaped mantles, several of which appeared to give a fine light. But he was only judging from the natural photometer—the eye. As to the costing on 8760 hours, the number in the year, he would be more inclined to base his cost on the lamp use, which was for 2000, 3000, or the number fixed by the authorities. Referring further to the globes and their breakage, he thought the individual lamp should be like the proverbial herring, and hang by its own head.

Mr. GRAFTON replied concisely—keeping, in spite of the criticism, to the assertions in his paper on every point. Referring to the statement on the necessary constant composition of the gas, he said Glasgow gas did not vary hour by hour. With regard to the coating on the main, they had nothing to fear from this, because they did not benzolize their gas. Nothing would carry better than the natural gas. He looked upon benzolized gas as an adulterated gas. He could not agree with Mr. Allen about the word "switch;" they desired concise terms. Explaining his views on the inverted mantle, he said the reason they had got away from the upright mantle was because the pressure at 90 inches would make it fly away. With regard to the question of the size of the mantle, his point was that, if he reduced the size of his mantle, he had placed inside the mantle such a volume of gas that it was squeezed up, and as soon as there was a puncture the flame shot out, and he had a broken globe. From Mr. Whitelaw's comments on uniform composition of the gas, he seemed to think the composition of the gas necessarily meant a continuous change of the adjustment to bring about uniform efficiency. He (Mr. Grafton) was certain Glasgow gas did not vary to the extent that implied individual attention. Holding to his views on the basis of cost, he said that burning hours were not quite the thing to fix anything on. They could not fix burning hours, when they were liable, for instance, to have fogs and lamps which were likely to be lighted during the day. In reply to a question regarding the nature of the flame in his test, he might say it was a homogeneous one. Speaking as to the main, that which he suggested putting down was for business premises. He did not wish to interfere with the public department's lighting apparatus. A separate main was needed. Again, the less mechanism one put down in high-pressure supply, the better the result. To strangle it with extra apparatus—such as governors—was another charge against high pressure, and he wanted to get away from that.

Mr. Grafton's remarks were received with hearty applause, so that the Chairman said he would see it was not necessary to move a vote of thanks.

AWARDS FOR LAST SESSION'S PAPERS.

The CHAIRMAN then intimated that, in the allocation of awards for the best paper of last session, Mr. Leckie, of Holytown, carried off the medal for his paper on "Experiences in a Small Gas-Works;" Mr. Grant, of Wall Street, came second, with his paper on "Prepayment Meters."

A Good Advance of Salary.—The salary of Mr. H. P. Maybury, the Surveyor to the Kent County Council, has been increased by £500 per annum. We understand that when this resolution was communicated to Mr. Maybury, he consented to withdraw his candidature for an important appointment in another county. It was felt that in him the Council had a Surveyor of especial competence and ability.

Continuous Distillation of Tar.—A process for the continuous distillation of tar has been devised by Herr H. Beck, who has taken out for it a patent for Germany. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the tar is heated indirectly only, and entirely by highly superheated steam, to temperatures up to 400° C. The apparatus consists of a vertical double-walled vessel, containing a system of tubes, which is divided up into a number of communicating compartments, insulated from each other by means of double walls. The exclusive use of superheated steam is said to be specially advantageous when distilling tars for hard pitch, which is then obtained free from coke. Further, it is stated that no pyrogenic decomposition of the fractions takes place; hence the phenols and the anthracene oil are obtained in a much purer condition than usual, and the crude anthracene is of high grade—furnishing a particularly pure product.

Local Legislation, 1909-12.—We have received from Messrs. Walter Southwood and Co., Limited, of Craven Street, Strand, two volumes which have been published by them on the subject of local legislation. They contain a collection of the provisions of Private Acts of Parliament obtained by Provincial Corporations and Urban District Councils in England and Wales after consideration by the Local Legislation Committee of the House of Commons. One volume deals with the years 1909 to 1911, and a supplement contains the provisions in the Bills of the present session. They have all been compiled and arranged by Mr. Frank Noel Keen, LL.B., of the Parliamentary Bar; and the larger volume has an introduction by Sir Charles Nicholson, Bart., M.P. The sections of the various Acts are arranged in paragraphs numbered consecutively; and the classification of the paragraphs according to subject matter is effected by dividing the books into parts, and subdividing each part by means of headings in large type. The author has produced two exceedingly useful books, as the provisions are so grouped and indexed as to be easy of reference.

New Gas-Fired Pottery Oven.—The Engineering Supplement to "The Times" last Wednesday contained the description of a new type of gas-fired oven, built for Messrs. J. H. Barratt and Co., of Stoke-upon-Trent, by the Dressler Tunnel Ovens, Limited. It is in the form of a tunnel, and is designed for continuous firing. The flame is not permitted to come into contact with the goods at any point, but is contained in combustion chambers or flues which lie as independent horizontal shafts on ledges on either side of the track upon which run the trolleys carrying the goods. These chambers are about 80 feet long, and are so constructed that they allow of a circulation of air externally all round them. An extractor fan is used to keep the chamber always under a slight vacuum, and vacuum pipes are connected to the chamber at intervals, their ends projecting outside the oven for water-gauges. In this way the atmosphere in the oven is easily under control. The fuel used is coke; but any fuel that will produce gas may be utilized. The fuel is gasified in a brick-built producer, and the gas is introduced by conduits therefrom to the combustion chambers, which are situated at about the centre of the oven. A damper is employed to regulate the flow.

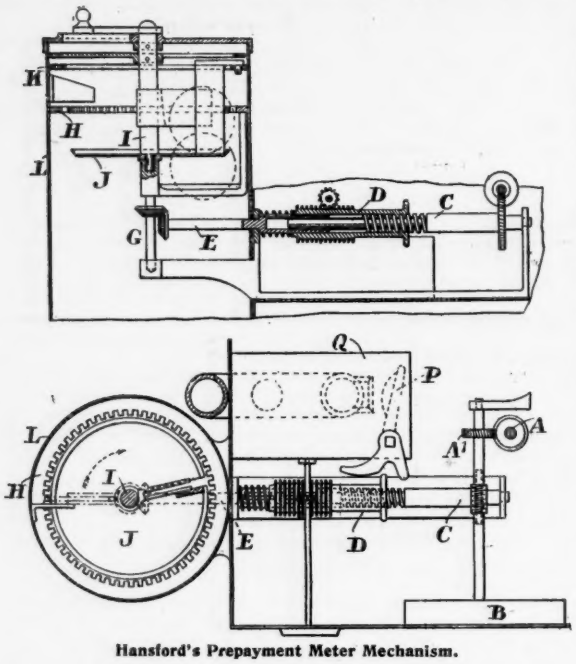
REGISTER OF PATENTS.

Prepayment Mechanism for Gas-Meters.

HANSFORD, J. & J. B., of New Barnet.

No. 17,539; Aug. 1, 1911.

This invention consists in "a simple and effective construction of mechanism which can be applied as an attachment to any gas-meter of ordinary type." It relates more particularly to mechanism in which the manual rotation of a coin-carrier is transmitted to an internally toothed circular rack or ring by means of the coin itself, the edge of which (when the coin is in position in the carrier) engages between two teeth of the circular rack, which, in turn, is suitably geared with the mechanism that effects the opening and closing of the gas-cock.



Hansford's Prepayment Meter Mechanism.

In the accompanying vertical longitudinal section and plan view of a meter (with the cover of the coin receptacle removed), A is the meter crank-shaft, which is geared through worm gearing with the spindle of the counter B. The counter spindle is connected through worm gearing with a shaft C, one end of which (screw-threaded as shown) screws into an internally screw-threaded sleeve D, which is provided with a flange or collar for the purpose of actuating the gas-valve. This sleeve is correlated with a spindle E journalled in alignment with the spindle C by a pin in the sleeve engaging a longitudinal slot in the spindle E, or in a sleeve encircling the spindle and rigid therewith (as shown). The sleeve has a worm or circular rack cut around a part of its periphery and gearing with a pinion or worm wheel fast on the spindle of an indicator F, which is adapted to show the quantity of gas remaining to be supplied at every instant. When the spindle E is rotated and the spindle C is held, the sleeve D will (by reason of its relation with the spindles E and C) be traversed longitudinally in one direction or the other according to the direction of rotation of the spindle E. When the spindle C is driven by the action of the meter mechanism and the spindle E is stationary, the sleeve will be traversed longitudinally along the common axis of the spindles E C. [This mechanism is broadly of known character in apparatus of the class to which the invention relates, and no claim is made to it apart from the apparatus, now to be described, with which it co-operates.]

The spindle E is geared through bevel pinions G with a vertical spindle journalled in a footstep bearing and carrying upon a supporting frame an internally toothed circular rack H co-axial with the spindle. The upper end of the spindle furnishes a footstep-bearing for another spindle I, which has rigidly attached to it a vertically slotted member and a horizontal disc; the latter having a radial slot in register with the slotted member, and adapted to receive the prepayment coin. The member in conjunction with a normally stationary (but adjustable) disc J constitutes the coin-carrier. The disc is disposed above the footstep-bearing at the upper end of the spindle, and is adapted to be turned around the lower end of the spindle journalled in the bearing—a vertically projecting bracket being provided with a set-screw or pin whereby the angular position of a slot in the disc J is determined. The set-screw or pin co-operates for this purpose with a ring K fixed around the inner periphery of the coin receptacle L concentric with the spindles. This ring is furnished with a series of holes or notches equal in number with the teeth of the circular rack H. The spindle I projects upwardly through the cover of the coin receptable, and has at its upper end a crank-handle, whereby the spindle I, together with the coin-carrier and slotted disc, can be rotated by the consumer.

In the cover is a coin-slot, and attached to the casing L is a stop, which arrests the coin-carrier in such a position that the slot in the disc is then in register with the slot in the fixed cover. In this position, a coin dropped through the slot will be held vertically supported by the disc and carrier. The construction of the latter and its relation with the circular rack H are such that the edge of the coin will in this position necessarily engage in the circular rack. This is the zero position of the apparatus; and upon the handle being turned in the only direction in which it can be turned in this position, the spindle carrier and coin will be rotated, and with them, through the direct engagement of the coin, the circular rack H and spindle will also be rotated. Such rotation of the rack and spindle will be continued until the coin is brought over the discharge slot in the supporting disc J, and drops through it into the space provided for the coin. The angle through which the spindle is rotated is obviously determined by the angular position relative to the slot in the cover to which the discharge slot has been adjusted through the medium of the pin and ring prior to the cover being secured in position. Since the rotation of the spindle produces an axial displacement of the sleeve D commensurate with the angle through which it has been turned—that is to say, commensurate with the setting of the disc J—and the amount of gas which can be supplied to the consumer is determined by the axial displacement of the sleeve D, it is obvious that within a very wide range (extending from zero to a complete revolution of the spindle I) the quantity of gas represented by the value of a given coin can be varied to a very great extent.

Gasholders.

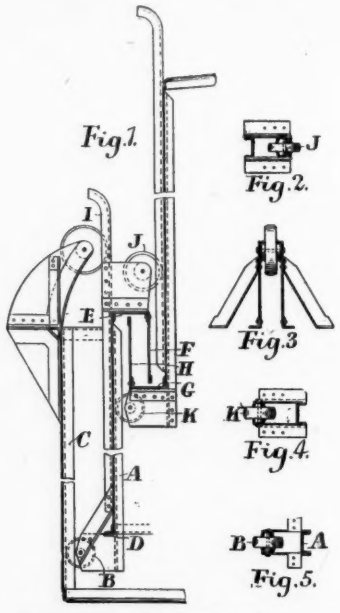
BLAKELEY, W., of Thornhill, near Dewsbury.

No. 3255; Feb. 9, 1912.

This invention relates to means for guiding gasholders in such manner as to obtain a vertical rise and fall as with the column-guided gasholder, but without the necessity of employing external guide-framing.

Upon the upper edge of the gasholder tank are fixed a number of carriages provided with guide-pulleys or runners; and on the holder are a corresponding number of vertical guides formed of channels, rails, or plates, arranged equidistant around the holder, in or on which the pulleys run. A like number of carriages carrying pulleys or runners upon the bottom of the holder work in or on guides fixed on the inside of the tank. By this means, the patentee points out the holder in rising and falling is always guided at two points on each vertical guide, and any tendency to overbalance, on account of wind pressure, is counteracted by the various sets of pulleys or runners which are in contact with the guides at the various points around the holder—each "bearing a proportion of the strain as may be demanded by circumstances." The guides may be further stiffened on the inside of the holder by additional guides, rails, joists, plates, or the like; "but in most cases the interior guides will be used for this purpose, and the gasholder plates for the attachment of these guides may be made stronger in this portion of the gasholder."

It is mentioned by the patentee that it has previously been proposed to substitute, wholly or partially, for the usual external column guides of a gasholder, guide irons within the tank and within each lift of the holder, engaging radial and tangential guide pulleys projecting outward from the next inner or higher lift of the holder, for similar purposes. But according to his invention, each lift of the holder below the top lift has both internally and externally projecting guides and guide-pulleys, as will be understood upon reference to the accompanying illustration.



Blakeley's Guiding for Gasholders.

Fig. 1 is a vertical section of the side of a double-lift holder, showing one set of guide-channels and pulleys. The number of sets (spaced out equidistantly around the holder) will vary according to the size of the holder. Fig. 2 is a plan showing one pulley and adjacent parts. Fig. 3 is an elevation of a pulley and its bearing taken at right angles to fig. 1. Figs. 4 and 5 are plans of the pulleys with adjacent parts.

At the bottom of the guide A is carried a pulley B, engaging the guide C. D is the bottom curb of the outer lift, E the dip channel, F the dip-plate fixed to this channel, G the channel-cup fixed to the inner lift, and H the cup-plate for holding water. The channel-guide has a projection I above the top of the outer lift, for the purpose of accommodating the pulley when the outer lift is resting on the tank bottom. J is a pulley in a carriage fixed to the dip channel E, and engaging the outer channel-guide and stiffener on the inner lift. The inner lift is

provided with an inside vertical channel stiffener, at the bottom of which is carried a pulley K, the carriage of which is also secured to the channel cup G—this pulley engaging the guide A inside the outer lift. A projection on the stiffener above the crown of the holder overlies the pulley J when the inner lift is resting on the tank bottom.

Gas-Governors.

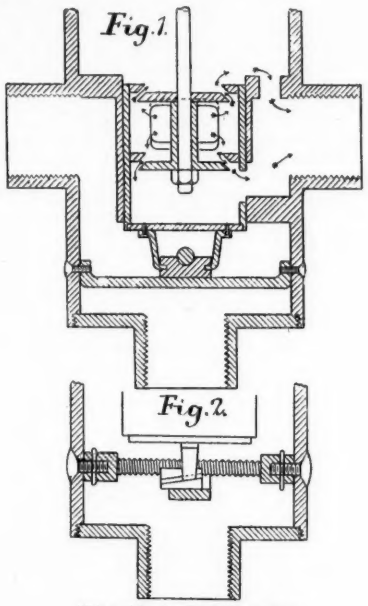
M'Lachlan, R. W., of Enfield Highway.

No. 4192; Feb. 20, 1912.

This invention refers to an adjustable valve for use in governors and the like, the object of which is to obviate the use of weights, springs, &c., for obtaining a desired working gas pressure.

The construction is as follows: In a body or casing of suitable form, a hollow cylindrical movable fitting with its lower end capped is provided in which the ordinary stationary valve seat or seatings are fixed—the working or movable plate or plates being suspended by a rod in the usual manner. In the cylindrical fitting, corresponding inlet and outlet ports are provided—the stationary seat or seatings being fixed above and below them. In order to create an increased or decreased pressure, the movable part of the fitting to which the stationary seatings are attached, is raised or lowered to a desired position, thereby allowing the working plate or plates of the valve to rise beyond their normal position, which causes the pressure of gas to rise or fall as the case may be.

For raising and lowering the cylindrical capped fitting to which the stationary seatings are fixed, a traversing wedge-shape grooved nut is provided, which is retained in position by a bridge fixed in the governor or regulator casing. This nut is traversed by a screwed shaft, of any desired pitch, with lugs at either end to receive grooved or milled headed screws, for the purpose of revolving the shaft from the outside of the governor casing. On the underside of the cap or plate of the cylindrical fitting, tongued brackets are fixed and made to work in the grooves of the wedge-shape nut. Therefore, any rotary movement of the screwed shaft will traverse the nut and cause the cylindrical fitting carrying the fixed seatings to move up or down a desired distance, and so give a varying pressure of gas.



M'Lachlan's Gas-Governor.

Fig. 1 is a section showing the invention partly in action applied to a double-strike valve, and also showing a sectional view of a device for raising and lowering the same. Fig. 2 is a side-view of the raising and lowering device, partly in section.

Gas-Burners.

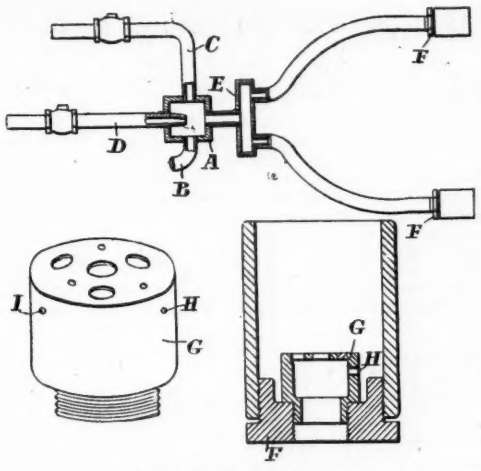
Marks, E. C. R.; a communication from the Gault Brazing and Manufacturing Company, of Kentucky, U.S.A.

No. 8412; April 9, 1912.

This gas-burner comprises a containing cylinder, a burner situated therein having one or more openings in its side directed towards the side of the containing cylinder, one or more openings in its top directly above the lateral openings, and one or more openings in its top for directing gas into the containing cylinder. The opening or openings in the top situated directly above the lateral openings are directed diagonally towards the side of the containing cylinder, and the latter extends far enough beyond the burner-nozzle to contain the diagonal columns of gas.

The mixing-chamber A receives gas through the valve-controlled pipe C on one side, free air through the pipe B on the other side, and compressed air through the valve-controlled pipe D, emitted through the nozzle into its centre. If the gas is to be burned at more than one point, the mixture is then conducted to the distributing chamber E, and thence, in flexible pipes, to the burners.

These consist of the connecting piece F, into the centre of which is screwed the burner-nozzle G, which has passages through which the main portion of the gas passes. It also has in its top small passages which slant diagonally toward the cylinder, and are adapted to direct small columns of gas towards its wall. Directly below each of these



Gault's Heating Gas-Burner.

slanting passages, in the side of the burner-nozzle, are horizontal passages, two of which H I are shown.

In the ordinary burner, when the pressure of the air admitted through the pipe D becomes too strong, the flame is blown out too far, the connection is broken, and the flame goes out. By making the cap G of larger cross section than the passage which leads into it, a sleeve or casing of gas is provided, which keeps the lazy flames burning at the outside ends of the passages H I, when a strong column of air shot through the centre of the cap causes all the flames burning from the top of it to go out.

The purpose of the small slanting passages is to shoot small columns of combustible gas directly over the lazy flames burning at the passages H I; thus causing all the columns of gas passing through the top of the cap to ignite rapidly from the lazy flames burning at the side of it. Otherwise, the lazy flames would go out before the main column of gas emitted through the top of the cap could be again ignited.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Carbonization in Vertical Retorts.

Sir,—In your issue of Nov. 26 there appears a letter by Mr. J. H. Toogood.

No one will challenge Mr. Toogood's right to his own opinion as to what constitutes British enterprise; yet when he claims "British invention" as being all his own by using such phrases as (1) "since this is precisely the claim," and (2) "in coupling the merits of one system to the name of the other," such cannot pass as a final gratuity "for the benefit of your correspondents."

For the purpose of allowing your correspondents to judge for themselves, it is necessary to repeat one of the claims made by Mr. Toogood for patent No. 20,851 of 1908: "A method of charging consisting in feeding a relatively thin stream of coal adjacent to the side of the retort." And for the purpose of judging to what extent Mr. Toogood has been anticipated in his claim, it is also necessary to give extracts from the patent granted to Messrs. Settle and Padfield—viz., patent No. 12,552 of 1902.

(1) "Consisting in introducing the coal into the top of the retort in small quantities at regular intervals."

(2) "The mode of carbonizing coal in vertical retorts, consisting in introducing coal into the retort in such a manner that the coal will fall towards the walls of the retort."

(3) "A vertically reciprocating coal measuring and gas sealing device in the cylinder, such device being so formed as to direct the falling coal outwards towards the walls of the retort."

If the above extracts fail to assure Mr. Toogood that both his "claims" and his "merits" are too late, then he might find solace in reading the following—an extract from the opinion given by one of the most eminent Counsel on Patent Law regarding the Settle-Padfield invention, viz.:—

> "This being so, I am of opinion that the letters patent are valid, and would be supported by a Court of Law."

I have no desire to attempt to thwart Mr. Toogood's efforts to illuminate British enterprise. I think, however, he might be more just than to publish to the world merits as his own when I honestly assure him the same merits were at least ten years old at the time he thought they were his own.

T. Settle.

Exeter, Nov. 29, 1912.

Benzol for Motors.

Sir,—If your correspondent "X" will trouble to read again the article in question, he will see that the statement he queries is indeed a fact. I commend also to his notice a certain seven-word proverb.

H. W. Seymour.

Leeds, Nov. 28, 1912.

Extensions at Blackpool Gas-Works.—Considerable extensions are contemplated at the Blackpool Corporation Gas-Works, to meet the increasing demand of consumers; and at last Wednesday's meeting of the Finance Committee, it was decided that application be made to the Local Government Board for sanction to borrow £31,750.

GAS AUTHORITIES AND RESIDUAL PRODUCTS.

JOINT COMMITTEE OF PARLIAMENT.—Tuesday, Nov. 26.

(*Before Mr.* HILLS (*Chairman*), *the Earl of* CRAVEN, *Lord* HOWARD DE WALDEN, *Lord* PLUNKET, *Lord* BRAYE, *Lord* INCHCAPE, *Mr.* LARDNER, *Mr.* WALTER REA, *Mr.* SAMUEL ROBERTS, *and Mr.* GEORGE THORNE.)

The Joint Committee of the Houses of Lords and Commons appointed to consider whether any, and, if any, what, restrictions should be imposed on gas authorities with respect to the purchase and manufacture of the residual products resulting from the manufacture of gas by other gas authorities, or of other chemicals, got seriously to work on Tuesday. Although at the commencement of the proceedings two members were absent, they were not long in putting in an appearance; and there was a full Committee for the rest of the day. A slight alteration was found to have taken place in the matter of Counsel; and it is explained in the preliminary speeches below.

The Counsel present were Mr. J. D. FITZGERALD, K.C., and Mr. LYNDEN MACASSEY, K.C., for the United Alkali Manufacturers' Association; Mr. BALFOUR BROWNE, K.C., Mr. C. C. HUTCHINSON, K.C., and Mr. A M. PADDON (instructed by Messrs. R. W. Cooper and Sons) for the Gas Companies' Protection Association. The same Counsel also appeared for the Association of Municipal Corporations. Mr. HONORATUS LLOYD, K.C., represented the South Metropolitan Gas Company.

POSITION OF THE SOUTH METROPOLITAN GAS COMPANY.

Mr. BALFOUR BROWNE opened the proceedings by mentioning to the Committee that he was now appearing for the Institution of Gas Engineers, the Gas Companies' Protection Association, and the municipalities owning gas undertakings. At the time of the preliminary meeting of the Committee, the municipalities had not had time to consider their position; and this was one of the reasons why the Committee was adjourned. Since they had considered their position, however, realizing that their interests were identical with those of the Gas Companies' Protection Association, the municipalities owning gas-works had instructed himself, Mr. Hutchinson, and Mr. Paddon to appear for them as well as for the other bodies. This would save duplication of evidence, and, he hoped, shorten the inquiry.

Mr. HONORATUS LLOYD, addressing the Committee, said on the last occasion Mr. Fitzgerald was good enough to announce that he (Mr. Lloyd) appeared with Mr. Fitzgerald for the Alkali Manufacturers' Association, and, of course, when he said so it was perfectly accurate. He had had the pleasure of being retained by them; but subsequently the South Metropolitan Gas Company, who had a prior right to his services, claimed him on the opposite side to Mr. Fitzgerald, and therefore he had to depart from the alkali manufacturers. He need hardly say he knew nothing of their case. He was now instructed to appear on behalf of the South Metropolitan Company to crave a hearing for them for reasons which he would give very shortly. The South Metropolitan Company was one of the largest gas undertakings in this country, having the right to supply, and were supplying, over some 50 square miles in the southern part of London. This question to them was one of the very greatest importance—so much so, that when it first arose during the present session of Parliament, upon the South Suburban Gas Company's Bill, the South Metropolitan Company's name was specifically mentioned as one of those against whom the attack of the Alkali Manufacturers' Association was made; and they thereupon put in a petition against alterations to the South Suburban Gas Bill, in the hope that they might have their case heard. It was held, however, that the South Metropolitan Company had no right to appear on the South Suburban Bill; and they failed to obtain a hearing. Consequently, they were now most anxious that their particular case should be known by the Committee before any decision was come to on this matter. The powers of gas companies varied according to the provisions of their Special Acts; and the South Metroplitan Company claimed that in their Special Acts they had very particular powers, under which they had spent a large sum of money. They now owned and worked plant in which sulphuric acid was made, and they also had a very large tar distillery. Therefore, any decision that might have the effect of rendering all their capital expenditure on these works absolutely obsolete would throw a burden upon the whole of their undertaking. It would have the disastrous effect of raising the price of gas, which was now so low thoughout the South of London; and it would also have the effect of postponing the time when any reduction in the price could take place.

The CHAIRMAN asked if this was not common ground for all the municipalities and gas undertakings. How did the South Metropolitan case differ from that of Mr. Balfour Browne's clients?

Mr. HONORATUS LLOYD argued that his case differed in this respect—namely, that the Acts conferring powers on several undertakings varied in terms. The South Metropolitan Company had Special Acts giving them particular powers under which they had spent a very large amount of capital; and although it was conceivable that Mr. Balfour Browne would be able to do much in presenting his case to the Committee, yet the matter was one of such vital importance, not only to his Company but to their very large number of consumers, that he was anxious that the South Metropolitan case should be placed fully before the Committee. He would undertake not to call more than one witness to place the facts before the Committee; so that more time would not be occupied now than was originally anticipated, before the municipalities and gas companies placed their case in the hands of the one Counsel. It might be said that the Company for whom he appeared were already represented in the Gas Companies' Protection Association, and that therefore he ought not to be heard. The South Metropolitan Company, as a matter of fact, had felt that technically this might be an answer to his application. Therefore, in order to prevent the technical point arising, they had resigned from the Association, and they were no longer represented by them. Under these circumstances, he ventured to ask that, before the matter was proceeded with, and before there was the risk of any restriction being placed upon the Company he represented which might have the effect of rendering a large portion of its capital obsolete, he should be accorded a hearing.

Mr. FITZGERALD expressed the hope that the Committee would not accede to this application. The Gas Companies' Protection Association, when the Committee first sat, included the South Metropolitan Company; and it was quite apparent that on the first day the latter were perfectly willing to have their case conducted in the same way as every other gas company in the Association. The single witness whom Mr. Lloyd proposed to call could quite well be called as a witness for the Gas Companies' Protection Association. With regard to Mr. Lloyd's representation, if he (Mr. Fitzgerald) had not mentioned the fact that Mr. Lloyd had been retained with him for the other side, the proposal of the South Metropolitan Gas Company would never have been made. But having heard that Mr. Lloyd had been retained, with himself and his friend Mr. Macassey, for the purpose of this investigation, the South Metropolitan Company at once proceeded to resign their membership of the Gas Companies' Protection Association, and further proceeded to claim Mr. Lloyd's services under a general retainer, and to make that claim valid, because it could not otherwise have been valid according to the rules of the Bar. He certainly hoped the Committee would not accede to their request to be heard separately. He did not think that, after he had stated openly to the Committee that Mr. Lloyd was one of the Counsel retained in support of the alkali manufacturers' case, it was in accordance with the ordinary practice of clients to adopt the course which the South Metropolitan Gas Company had adopted, although Mr. Lloyd was perfectly blameless. These rules were not made by the Bar; and if the question arose, Counsel had nothing to say to it. In these circumstances, he submitted that there was no reason at all for the South Metropolitan Company being heard separately.

The CHAIRMAN, after consultation with his colleagues, said the Committee saw no reason why the South Metropolitan Company should be separately represented. If it were desired that a witness should be called, he would see that such witness was called.

THE CASE FOR THE ALKALI MANUFACTURERS.

Mr. FITZGERALD then opened the case for the United Alkali Manufacturers' Association, pointing out that the inquiry had arisen owing to certain proceedings before Private Bill Committees in the present session of Parliament at the instance of the Alkali Manufacturers' Association and the London Chamber of Commerce. The alkali manufacturers had raised these proceedings owing to a practice which had developed in recent years of certain statutory gas undertakings going beyond the legitimate objects for which they had been constituted by Parliament, and claiming to have the right to embark upon the manufacture and sale of chemical products on a large scale in competition with the ordinary trader. In the opinion of the alkali manufacturers, the primary object of a gas undertaking was to manufacture and supply gas within certain defined limits. To carry out this object, gas undertakings had obtained from Parliament what was, in fact, though not in name, a statutory monopoly to supply gas within their specified areas; and the possession of this statutory monopoly placed them at once in the position of having a large and assured income, and enabled them to raise money in a manner which an ordinary trader could not do. The manufacture of gas, however, necessarily involved the production of certain residual products—namely, coke, ammoniacal liquor, tar, and spent oxide, which latter contained large quantities of sulphur. The three residual products which came into consideration in this inquiry were ammoniacal liquor (which contained large quantities of ammonia), tar, and spent oxide. It was necessary for gas companies to sell or in some way dispose of these residual products; and the old custom, which still prevailed with the majority of gas undertakings, was to sell the products to chemical manufacturers and tar distillers—in fact, gas-works were the only source of raw material to tar distillers. A considerable number of gas companies, however, found it more convenient—and probably they expected to find it more profitable too—to work up their residuals into other products and then sell them. By treating ammoniacal liquor with sulphuric acid, sulphate of ammonia and other compounds were produced. In the same way, spent oxide, which contained large quantities of sulphur, could be treated and converted into sulphuric acid. Similarly, from tar various products could be distilled which were valuable for road-making purposes, and which had a large and profitable outlet. Thus there were the two methods of dealing with the bye-products from gas-works; and it was against the practice which was growing up of gas undertakings purchasing residual products from other gas undertakings, and working them into chemicals and selling them in the open market, that the alkali manufacturers had commenced the proceedings this session. These undertakings which were objected to had set up as general chemical manufacturers on a large scale in competition with the private trader in a manner which was never intended by Parliament, and which Parliament had never intentionally authorized them to carry on. His contention was that the original powers conferred on gas companies were to enable them to manufacture and supply gas within certain specified limits, and to sell or dispose of the residual products that arose from the manufacture of gas *by them*. In some cases, gas companies had been able to get inserted into their Acts of Parliament words which it was open to argue covered anything which they desired to do beyond the mere manufacture and supply of gas; but he did not know of any case where a gas company had put before Parliament that they intended to carry on this business in competition with the ordinary trader. If they had done so, the whole chemical trade in the district would have opposed them; and the result could hardly be in doubt. It was the practice of Parliament, when powers were granted to undertakers for specific purposes, to confine the undertakers to these specific purposes. For instance, railway companies who were constituted to carry on business as carriers of passengers and goods were not allowed to set up in business as coal merchants. Gas companies bought large quantities of coal; and they would not be allowed to set up in business as coal merchants. The same principle applied exactly to the manufacture of chemicals and the distilling of tar. The gas industry was highly protected by Parliament for certain well-known

reasons; and to allow them to enter into competition with chemical manufacturers would give them the opportunity of running this part of their business at a loss in order to get rid of the private trader. The financial result of this would have hardly any appreciable effect upon dividends in the case of a company, or upon the ratepayers in the case of a municipality.

The CHAIRMAN: Are you now arguing against allowing a gas company to work up their own residuals?

Mr. FITZGERALD: No, only against going outside.

The CHAIRMAN: But it seemed to me that your argument rather carried you to the larger issue.

Mr. FITZGERALD replied that the reason why he did not intend to go into the larger issue was that, after full consideration of the cases this session, the alkali manufacturers came to the conclusion that they could not impress on the Committees before whom they came that existing companies should be prevented from working up their own residual products, as this had been a practice of long standing. A good deal might be said against it; but having regard to the fact that it was a practice of some standing, and also the fact that gas undertakings had to get rid of their residuals, it was thought the question could not be raised. He thought, however, the powers of the Committee were wide enough to enable them to deal with the question if they thought fit. So far as the manufacturers were concerned, he could not depart from the view taken up before the Committees this session.

The CHAIRMAN: I am glad to hear this, as it narrows the issue down to a comparatively small compass.

Mr. BALFOUR BROWNE challenged Mr. Fitzgerald's statement.

Mr. FITZGERALD insisted that he had never raised the larger question in one single instance this session. One of the gas companies, however, tried to make him raise it by putting a question in cross-examination. Continuing, Counsel said that in the case of municipal undertakings the objections he had raised to companies applied even more strongly, because they were able to carry on their business in a way that no ordinary trader could. So far as ammoniacal liquor was concerned, gas undertakings were the only source of raw material for commercial purposes, as it could not be obtained except as a residual from the manufacture of gas. With regard to tar, gas undertakings were the principal source. As to sulphur in the shape of spent oxide, again gas undertakings were a large source of the supply of raw material, although, of course, not the only one, because sulphur was found as a mineral in conjunction with various ores. If this practice was allowed to go on, it would inevitably end in the gas companies obtaining control of the greater part of the raw material which chemical manufacturers require for the purposes of their products. Under these circumstances they would, *cæteris paribus*, always obtain a preference in the supply of raw materials, and could command a high price—thus driving the other competitors out of the field. If chemical manufacturers were to be deprived of this source of raw material, it would bring their businesses to an end to a large extent, so far as sulphur and tar were concerned. With regard to what the gas authorities were doing, of course, it was very difficult for those outside the business to get precise evidence. It was known that some of them, only a small majority, were doing what was complained of. But apparently there were many others who would like to do it, and this was the reason for the appearance of the Gas Companies' Protection Association. The great majority of gas undertakers carried on their business quite successfully on the old lines, and did not go into competitive business with the chemical manufacturers. There were three large Companies in London—the Gaslight and Coke, the Commercial, and the South Metropolitan. The former had as its Governor or Chairman Mr. Corbet Woodall, who might be properly described as the head of the gas industry in this country. He appeared before Private Bill Committees on two or three occasions this year, and, in the course of his evidence, stated that his Company, the largest in the United Kingdom and probably in the world, had not found it desirable to do, or at any rate had not done, the things of which the chemical manufacturers complain. They had confined themselves to working up their own residuals. On the other hand, the Commercial and South Metropolitan Companies had undoubtedly done the things which were complained of in some shape or other. In the provinces, the extent to which the example of these two London Companies had been followed was not known. No doubt it was done in some cases; but so far as was known only to a small extent, and in a quite small minority of cases. Again, with regard to municipalities, it was very difficult to know what was being done, because, both in the case of companies and in the case of municipalities, if it were being done it was not shown in the accounts. It was, however, known that a large number of the principal towns in England which owned gas-works did not embark in the business which was objected to—in fact, so far as was known, not one of the principal towns did.

The CHAIRMAN: Do you propose to prevent existing companies from doing this—those who are now buying residuals and manufacturing—or is your suggestion that the restriction should only be against undertakings in the future?

Mr. FITZGERALD said he thought the restriction should be imposed generally. The business indulged in was not a legitimate business, and ought not to be carried on. With regard to municipal corporations, Birmingham was one of the largest gas undertakings in the kingdom, and had been very successful; but it appeared that the Birmingham Corporation sold the whole of their residual products. They did not even work them up. Again, as far as was known, Leeds and Manchester, two other towns with municipal works, did not carry on the business in the way objected to. In Scotland, there were two very large municipal works—namely, Edinburgh and Glasgow; and again, as far as was known, neither embarked on the business objected to. In Ireland, there were two large undertakings—Belfast, a municipality, and Dublin, a company; and in neither case were any of the practices which were objected to carried on. Among the smaller towns there was Coventry, who, as was mentioned before a Private Bill Committee, were buying materials from nine or ten different companies and carrying on a chemical manufacturing business in a very extensive manner. No doubt there were other municipalities which were doing the same; but the alkali manufacturers were unable to give any precise information, because the contracts they made, and what they did, were their own affairs. These did not appear in the accounts, and it was only incidentally that information was obtained. This was the state of things at the beginning of the present session of Parliament, when a large number of Gas Bills were introduced, numbering about thirty Bills and Orders altogether. In one of these at any rate very extensive powers were asked for the manufacture of chemicals, which, if they had been authorized, would have enabled the company to manufacture any kind of chemicals they pleased. In these circumstances, the Alkali Manufacturers' Association and the London Chamber of Commerce decided they must raise the question; and for this purpose they selected six typical Bills. At that time both bodies were under the impression that, if they raised the matter in this way, and had it discussed before a certain number of Committees, and if the decisions were uniform, the matter might be taken as settled. The first was the South Suburban Company's Bill.

Mr. BALFOUR BROWNE asked the Chairman how far he thought it necessary to go into these special Bills, because each case was decided on its own merits. The directions to the Joint Committee opened up an entirely new inquiry which would regulate Standing Orders in the future with regard to gas undertakings; and from this point of view it seemed to him that it was not necessary to go into what had been done in the past.

The CHAIRMAN said he took it that Mr. Fitzgerald was using these Bills to illustrate the practice of Parliament; and from this point of view he thought he was entitled to explain.

Mr. FITZGERALD said that, in connection with the first Bill, the South Suburban, a House of Lords Committee presided over by Lord Ritchie inserted a clause, after having adjourned the proceedings for a couple of days, during which time, he had no doubt, they consulted the authorities of the House. The clause was as follows:

> The South Suburban Company (notwithstanding anything in any Act relating to their undertaking or any part thereof) shall not purchase or use in any process of manufacture any materials other than those required for the making and supply of gas by them, or for the working-up of their own residual products, or for the construction, maintenance, and repair of their gas-works, plant, and buildings, or of gas-fittings.

Simultaneously the Annfield Plain and the Fleetwood Gas Bills were before a House of Commons Committee presided over by Sir Harry Samuel, who inserted a clause in almost the same words.

Mr. BALFOUR BROWNE interposed, and asked Mr. Fitzgerald to read Sir Harry Samuel's full decision, which was to the effect that his decision was not to be taken as a precedent, as there might be occasions where it would be advisable for small companies to be allowed to join together.

Mr. FITZGERALD agreed. Continuing, he said that the question arose again on the York Gas Bill before Lord Barnard's Committee, when Lord Ritchie's clause was inserted. Then it was discussed on the Birmingham Gas Bill before the Duke of Bedford's Committee, and a similar decision was arrived at. Again, in connection with the Swansea and West Kent Provisional Orders, these were unopposed in the House of Commons and went through without any clause, because a representation was made to the Committee that the Swansea Company were buying residuals from small companies who could not otherwise sell them; there being no other market nearer than Birkenhead or Liverpool. Between the two Houses the alkali manufacturers petitioned, and the cases were heard before a Committee presided over by Lord Clinton. Here it transpired that the Swansea Company were not in fact buying materials from small companies, and that, on the contrary, the small companies were able to dispose of their residuals in Cardiff and elsewhere in South Wales, and that one particular small company were selling them in Cardiff.

The CHAIRMAN here asked Mr. Fitzgerald not to go too much into detail, but only inform the Committee of the practice of Parliament.

Mr. FITZGERALD said the result of the Swansea case was that Lord Clinton's Committee inserted the Ritchie clause, and the West Kent promoters decided that they could not contest the decision in their case. These were the only cases which came before Unopposed Bills Committees where parties were heard. But in addition there were nineteen other cases in the course of the session, where the Unopposed Bills Committee in one House or the other inserted some amendment in the Bill, restricting the powers of the undertakers in the way desired by the Alkali Manufacturers' Association. Thus there were 26 cases in the present session where such a clause relating to residuals had been passed by Parliament, and there was no case where the matter had been discussed and a different decision arrived at. Clearly this clause had now come to be recognized by the House as one of the general provisions that ought to be inserted in Gas Bills, and in the Model Gas Bill this year an alteration had been made, the effect of which was to limit gas undertakers to working up their own residuals, and not allowing them to go outside and buy up other residual products. [We give the new clauses in the Model Bill below.*] Another point of view which he wished to impress upon the Committee was the speculative nature of a chemical business, which, in the interests of the shareholders and consumers, a gas undertaking ought not to be allowed to embark upon. It was certainly not the sort of business in which the money of the shareholders or ratepayers ought to be invested. Most valuable evidence had been given this session on behalf of the alkali manufacturers by a gentleman in the front rank of the gas profession—namely, Mr. Herring—who for many years had been Engineer of the Edinburgh

* MODEL BILL.

Clause 5.—The Company shall be established for the purpose of manufacturing and supplying gas for lighting, heating, motive power, and other purposes within the limits of this Act, and may convert, manufacture, and sell all residual products resulting from the manufacture of gas by them, and generally may carry on the business usually carried on by a gas company.

Clause 16.—Subject to the provisions of this Act, the Company may upon the lands described in the Schedule to this Act, erect, maintain, alter, improve, enlarge, extend, and renew or discontinue gas-works, retorts, gasometers, receivers, mains, pipes, stopcocks, machinery, and other works and apparatus and conveniences, and may do all such acts as may be proper for making and storing gas and for supplying gas within the limits of this Act, and may on the said lands manufacture and convert all residual products resulting from the manufacture of gas by them.

Gas-Works. Unfortunately, a gas engineer who placed himself in opposition to what was considered the interests of the industry with which he was connected, was in a very difficult position. Although Mr. Herring was of the highest eminence, and gave his evidence in a most painstaking way, he (Mr. Fitzgerald) was afraid that he would not be able to call him again before this Committee; but if the Committee cared to refer to his evidence——

Mr. BALFOUR BROWNE: No, no, you cannot have the evidence and not the witness.

Mr. FITZGERALD: Well, you know why I cannot call him.

Mr. BALFOUR BROWNE: I do not know any reason.

Mr. FITZGERALD: The principle of this matter was illustrated by several cases in the Law Courts. There was the case of the Great Northern Railway Company, who set up in business as coal merchants.

The CHAIRMAN: I think the Committee are aware of the fact that a statutory company can only carry on their statutory objects; and unless you have some special reasons for quoting the railway cases I do not quite see how they help you.

Mr. FITZGERALD: The reason is because I thought the judgment of the Vice-Chancellor in that case was so much to the point that it might almost have been given in reference to the present case. The decision was against the railway company, and similar decisions were given in other cases.

Counsel went on to say that the Alkali Manufacturers' Association had been called a ring, a combine, and a trust, and other names of an opprobrious nature. It had been alleged that they were desirous of regulating the prices and getting a monopoly, with the sole object of purchasing raw material at their own prices. There was no foundation whatever for these statements; and although they were made several times, no evidence was called in support of them. The United Alkali Manufacturers' Association was founded in 1866, for the purpose of looking after the trade interests of the alkali manufacturers, and especially with regard to the legislation affecting the trade. The Association had been recognized and consulted by Government Departments in matters relating to the chemical industry, factories, &c., and with regard to bye-laws and regulations in respect of Acts of Parliament affecting their trade. They had nothing whatever to do with the fixing or regulating of prices. Their membership was quite small, and the members of it were engaged in competition with each other. Outside the Association altogether there were large numbers of chemical manufacturers and tar distillers whose interests were identical with those of the members of the Association. The matter had been taken up not merely by the Association, but also by the London Chamber of Commerce and the Association of Coal-Tar Distillers. In conclusion, he read the resolution passed at the meeting of the London Chamber of Commerce early this year, when it was decided to take parliamentary action to protect the interests of the chemical trade.

MR. WILLIAM PEARCE'S EVIDENCE.

Mr. *W. Pearce*, M.P. (a Director of Messrs. Spencer Chapman and Messel, Limited, and of Messrs. William Pearce and Sons, Limited, chemical manufacturers), said he was a member of the Chemical Trade Section of the London Chamber of Commerce, and had been Vice-President of the London Waterside Manufacturers' Association. He had been in the business since 1868, and now employed 500 people in London, paying £1000 a week in wages. The capital of the concerns in which he was interested was £300,000. In 1870, no gas company made sulphuric acid or distilled tar, and comparatively few made sulphate of ammonia. The Alkali Manufacturers' Association felt that it was now too late to take any exception to the manufacture of sulphuric acid, although they thought this was being pressed against the private traders very hardly. They did, however, object to the general manufacture of chemicals by gas companies. At one time, his firm supplied the Gaslight and Coke Company with sulphuric acid; but in the seventies the Gas Company decided to make their own. This action created a great disturbance in the industry; and two or three large customers of his firm had to go out of business. However, they accepted it as the fortune of war, and nothing was said; and he admitted that, as far as the Gaslight and Coke Company were concerned, they had shown a great deal of consideration, and had not been aggressive In fact, he did not think this question would have been raised if all the other companies had used the same discretion as the Gaslight and Coke Company. The Commercial Company at first sold all their liquor, but afterwards decided to make sulphate of ammonia. He negotiated a contract with them for sulphuric acid for twelve or fifteen years. Then they decided to put up their own sulphuric acid plant, and again there was great disturbance caused in the industry, because there was not an exceptionally large market for sulphuric acid. A few years after this, having a surplus of their own, the Commercial Gas Company sold sulphuric acid to the Wandsworth Gas Company, whom he had been supplying for a great many years at quite a low price, because the Wandsworth Company took the cheapest kind of acid, by bulk, in barge. The price at the time was about 26s. per ton, on a contract for 600 to 700 tons a year; and though the Commercial Company secured the contract, the difference in price could not have been very much—probably from 2s. to 2s. 6d. per ton. This action created alarm, and the alkali manufacturers wondered where the competition would cease. It became evident that if the gas companies had unlimited powers to buy sulphur material, there would be no end to it. If the undertakings were confined to sulphate producing by themselves, and were allowed to sell the small surplus they might have at any time, no great harm would be done; but if they were to be allowed to increase their make of sulphur by purchasing materials from outside, there would be unlimited competition to face, which, he contended, it was not the intention of Parliament should be the case. Very much the same thing happened in the case of the South Metropolitan Gas Company, who had now taken away the South Suburban Gas Company from his firm. Here was a contract for 1600 tons; and the difference in price on the whole contract could not have been more than £200. But the Commercial Gas Company had not confined themselves to gas companies only. They had made contracts with outside people; and this had created a great disturbance in the London chemical trade. In an Act of the Gaslight and Coke Company in 1868, before they started the Beckton works, section 40 specifically referred to the selling and disposing of residual products obtained from the "making by them of gas."

The CHAIRMAN: Do you contend that the Gaslight and Coke Company have gone outside the terms of that clause?

Witness: I do not know that they have. It is possible; but it has not been done in a way that has come under my notice. As I said, I do not think they have been aggressive; and if everybody had acted in the same way, it would probably not have been necessary to raise this question.

What you object to is the effect of the manufacture of chemicals from gas companies' own residuals?—No; in this case they are confined to residuals arising from their own products. What I object to would be for the Gaslight and Coke Company to buy tar and other things and to work them up.

Witness (continuing) said the South Metropolitan Company had purchased tar from the South Suburban Company, and worked it up with their own tar. It was only just lately that this state of things had occurred, and it was a loss of raw material to the chemical manufacturers. It had been argued that small companies should be allowed to sell to the large companies. He had gone into the question of when it paid small companies to make their own sulphate of ammonia out of the ammoniacal liquor; and it appeared that it paid even the very smallest company to do this, rather than to sell their liquor. This opinion, moreover, was borne out by a paper in the "JOURNAL OF GAS LIGHTING," which had reference to Ireland. The paper was by Mr. T. Hornby, the Gas Manager at Longford, and was published in the issue for July 16 this year. From this it was clearly proved that it paid to manufacture sulphate of ammonia, even when the output was only 7 tons a year.

Mr. BALFOUR BROWNE objected to references from a paper unless the writer of it was to be called.

The CHAIRMAN said witness was only reading from the "JOURNAL" to confirm his own knowledge that it was a commercial undertaking to put up even a small plant for the manufacture of sulphate of ammonia. [To witness:] Is it within your own knowledge that even a small plant for the manufacture of sulphate of ammonia is profitable?

Witness: Yes. Continuing, he said that Longford only made 7 tons of sulphate of ammonia; but the profit was quite a large one when they considered that the ammoniacal liquor was obtained for nothing at the works. The cost of manufacturing sulphate of ammonia, even at an out-of-the-way place like Longford, would not be more than £5 per ton. Under more favourable circumstances, it might be even £3. This included everything except the cost of the ammonia; and his figure of £5 must be within the mark. Sulphate of ammonia was now worth £14 per ton, so that there was a total profit of £63 at Longford in a year, on an expenditure of only a few hundred pounds. His firm had supplied with chemicals companies who were making an even smaller quantity than this—as low as 2 or 3 tons of sulphate of ammonia a year. In the South of England, it was universal for small gasworks to manufacture sulphate of ammonia from their own residuals. In the North of Scotland and Wales, they had another string to their bow, because there was a great outlet for concentrated ammoniacal liquor—a process which reduced it to one-tenth of its original bulk. The point he wished to establish was that the small gas companies were by no means helpless. He then quoted figures from "Field's Analysis" to show that, in the case of the London companies, it was not at all essential to the interests of the shareholder or consumer that the working-up of residual products into chemicals should be carried on. These figures showed that the amount received from residuals per ton of coal carbonized only represented a very small proportion of the total charge for gas. The figures referred to the tar and ammonia products only, and were taken from "Field's Analysis" for the guidance of the Committee. The curious thing about the three London companies was that, whereas one would have imagined, looking at the value per ton of coal carbonized, that the result would be the same in all their cases, it was not actually; and perhaps this might be due to the fact that two of the companies were using a large quantity of carburetted water gas. For instance, the South Metropolitan Company did not use carburetted water gas; but the Commercial Gas Company had a make of 33 per cent., and the Gaslight and Coke Company, 22 per cent. of carburetted water gas. The total value the Gaslight and Coke Company got for residuals was equivalent to 3d. per 1000 cubic feet; and this could only make the very slightest variation in the price charged to the consumer. Another curious thing brought out by the figures was that the Commercial Gas Company did not distil their own tar, but sold it. The other two companies distilled their tar and carried on very much more complicated operations than the Commercial Company; but for some reason or other, which he could not explain, they actually got more for their tar and ammonia per ton of coal carbonized than the other two, who went very much further in their chemical operations. The figures were: Gaslight and Coke Company, 3s. 11·05d.; South Suburban Company, 3s. 10·26d.; Commercial Company, 4s. 4·45d. From the results of gas undertakings throughout the country, so far as the effect on the price to the consumer was concerned, it seemed to be immaterial whether they worked up their products or not. The Edinburgh Corporation, for instance, made sulphate of ammonia; while in Birmingham the Corporation sold all their residuals. Yet they both seemed to get the same results. Curiously enough, Coventry appeared to be very much worse than the others; and yet this was the town which purchased from eight or nine other companies. There the value per ton of coal carbonized was only 3s. 0·24d. Then, again, there was the question of the heavy cost for renewals and maintenance of chemical plant. This might bear heavily upon gas undertakings, having in view the increasing use of carburetted water gas. In fact, at one of the meetings of a London company recently it was stated that carburetted water gas had been supplied to the whole of the district for a fortnight without anybody knowing anything about it. In the case of gas companies, this effect would render it necessary for the charges for sinking fund to be revised. He maintained that the ordinary chemical manufacturer had no chance against the overwhelming opposition of the gas industry.

The net profits of the three London Gas Companies per 1000 cubic feet of gas were 10·82d., 8·89d., and 7·47d.; and with profits in the region of 20 per cent. up against him, no chemical manufacturer could put up new plant with such powerful competition hanging over him. It would be a distinct check to chemical enterprise in this country if these methods were allowed.

Mr. BALFOUR BROWNE commenced his cross-examination of the witness by eliciting the fact that the combined capital of the Companies forming the Alkali Manufacturers' Association was some £20,000,000. Questioned as to the attitude of the Alkali Manufacturers' Association towards non-statutory gas companies, witness said he did not regard these in the same position as statutory companies, and was content to take their competition as in the ordinary way of business. It was true there was the Mond Gas Company, against whom no action was being taken; and it was pointed out to him as a curiosity that Messrs. Brunner, Mond, and Co. were members of the Alkali Manufacturers' Association. But the reply was that the Mond Gas Company was a distinct undertaking. Witness's contention that Lord Ritchie's clause would allow one gas company to purchase sulphuric acid from another was not agreed to by Counsel, and witness followed up his argument by saying that the only stipulation was that the selling company should confine their sales to the sulphur which they produced from their own residual products.

Mr. BALFOUR BROWNE: I do not understand. If they cannot buy sulphur except under these conditions, that means a restricted market if I am a sulphur seller. On the other hand, you can come in and buy in a restricted market, which is to your advantage. Do you think that fair?

Witness: I certainly do. Continuing, he said the sulphur produced by gas companies was a small source of supply, and represented only a small quantity of the sulphur produced by the world. The fact that gas manufacture resulted in a production of sulphur was the only excuse gas undertakings had for making sulphuric acid. No alteration was asked for with regard to this; but in the case of a gas company who could manufacture (say) 4000 tons of sulphuric acid from their own bye-products, if no limitation were put upon them they could manufacture 40,000 tons, or, indeed, any quantity by buying sulphur and pyrites outside. He certainly did not think it would seriously handicap the gas company to limit it in the way the alkali manufacturers suggested. There was great insecurity in the chemical industry, and the chances were all in the favour of gas undertakings making a loss.

Mr. BALFOUR BROWNE: If I can prove to the Committee that it is to the interest both of the shareholders and consumers, do you think it would be a fair thing for Parliament to put this restriction upon a gas undertaking?

Witness: I think the effect is so serious that Parliament should take that line.

Asked as to the dividends paid by the various members of the Alkali Manufacturers' Association, witness said he could not give figures. As to his own firm, "Well," he added, amid laughter, "they have survived." Many chemical firms had failed; and his Company considered themselves fortunate that they had kept up, and had been able over a period of years to pay an average dividend of 10 per cent.

Mr. BALFOUR BROWNE then read extracts from several old Gas Acts, in which the widest possible powers were given to "deal in" residual products. The first was the Mitcham and Wimbledon Act of 1867, which Company also had another Act in 1869.

Witness said that, in his opinion, the clauses giving these powers were governed by the fact that the Act related to the manufacture of gas by that Company only.

Mr. BALFOUR BROWNE pointed out that the clause did not contain the restriction that it related to the manufacture of gas by the Company. Moreover, it could not have been intended to be so applied, as it gave the power "to deal in" residual products; and this obviously included buying as well as selling.

The CHAIRMAN: When you find in an Act of Parliament an express power to the gas company to purchase ammoniacal liquor which can only be purchased from another gas company, that must carry with it the power to purchase from other companies?

Witness: I do not think it was ever intended. These words apply to the whole operations of the gas company. I do not think it was ever grasped by anybody that this question was likely to arise; and the same form of words were allowed to cover two distinct operations of the company—namely, lighting and chemicals. If the powers are in, they have got them in without the chemical trade being aware of it.

Mr. BALFOUR BROWNE went on to refer to other Acts, including Derby, Lichfield, and Torquay, in all of which were full powers "to deal in" residual products. Leaving the older Acts, he referred to the Glasgow Act of 1910, which was a consolidation of the Glasgow Corporation's gas powers. Here, again, the Corporation were empowered to "sell, provide, supply, and deal in coke, coal, tar, pitch, asphaltum, sulphate of ammonia, ammoniacal liquor, oil, and all other products or residual of material employed in, or resulting from, the manufacture of gas, and also may manufacture, purchase, hire, let, lay down, place, maintain, sell, provide, supply, and deal in engines, motors, lamps, burners, fittings, tubes, pipes, and other articles and things in any way connected with the gas-works, and with the supply and use of gas, and generally may carry on such operations or business as are for the time being usually carried on by gas companies. Where, he asked, was the Alkali Association when that clause was passed?

Witness, during further cross-examination, said the Association had raised this question with great regret. The interests of the Association were bound up with those of the industry, and it was only because they felt it was such a very serious matter that they had brought it before Parliament. He did not know that the following words were in the Model Bill of 1897—"and may manufacture, sell, provide, supply, and deal in, coke, tar, pitch, asphaltum, ammoniacal liquor, oil, and all other products or residuum of materials employed in, or resulting from, the manufacture of gas." Neither was he aware of certain evidence given before the Municipal Trading Committee in 1900 by Sir Courtenay Boyle, then Permanent Secretary to the Board of Trade, and by Mr. Albert Gray, now Counsel to the Chairman of Committees, who both expressed the opinion that gas-works should have the power "to deal in" residual products, as this was an important fact in determining the price at which gas could be sold. Mr. Pearce's answers to all questions of this character was that the Association were advised that the whole of a Gas Act was governed by the fact that it related to the manufacture of gas by the particular undertaking referred to.

Cross-examining witness upon his suggestion that the profits made by a gas undertaking from residual products were so small as to be negligible, Mr. BALFOUR BROWNE asked if he would consider a reduction of 1d. or 2d. per 1000 cubic feet as being not worth speaking about. The answer was that it was not comparatively a serious thing.

Mr. BALFOUR BROWNE: Your objection is to competition?

Witness: Exactly. My point is that gas companies would never make sulphuric acid except that they want it on their premises.

Your whole intention is to limit competition as far as possible—to limit the open market, and make it a closed market for the chemical manufacturers. You will allow people to sell, but not to buy; and this will enable you, as purchasers, to buy very cheaply?—To some extent that may be maintained.

Would you object to the Wandsworth Company purchasing the surplus sulphuric acid from another gas company?—So long as it is made from the company's own sulphur surplus.

You want to avoid unlimited competition?—By people who have special advantages which nobody else possesses.

In answer to further questions, witness stated that he objected to a gas company purchasing tar to add to that which was produced at their own works. If the residual products at a gas-works were sufficiently large for the company to work them up, well and good; but if not, then they should be compelled to sell them, but not to another gas company. The gas companies had always sold to the alkali manufacturers; and they did not want to lose this source of supply. In reply to a question by Counsel as to it being desirable for road authorities, for instance, to be able to secure a supply of tar materials on the spot, in order to reduce the cost of carriage, witness held that it was the invariable practice of small companies to work up their own residual products into sulphate of ammonia. This was the position to-day; but he doubted whether there was any difference in the cost when tar was made on the spot or not, because the larger manufacturers at a distance were able to make at a lower cost, and the addition of the cost of carriage would bring it up to the value of the tar made in smaller quantities on the spot. In the South of England, it was a common practice for all small gas companies to have their own sulphate plants; and he knew that they were able to run them profitably without the necessity for purchasing from other companies. Dealing with the history of this action by the Alkali Manufacturers' Association, witness said he first raised it at a meeting of the Chemical Trade Section of the London Chamber of Commerce, where it was regarded as of very great importance to the chemical trade. There was no Association for the protection of chemical manufacturers similar to the Gas Companies' Protection Association. Therefore it was felt that the Alkali Manufacturers' Association should take it up. If there had been any other body, it would never have gone to the Alkali Manufacturers' Association.

Mr. BALFOUR BROWNE: Does any member of the Association try to regulate prices?

Witness: No.

There is no understanding in the Association not to undercut each other?—There is no general understanding of the kind.

Are you sure?—I know nothing of it.

Is there any districting—giving certain firms rights in certain districts over other firms?—I do not think there is even that.

Are you speaking of sulphuric acid or in general?—Mainly of sulphuric acid.

Do you say there is no "ring" with regard to sulphuric acid?—I have not heard of any, even in ammonia or tar. I believe there is no such thing.

In re-examination by Mr. FITZGERALD, witness said that all the clauses read by Mr. Balfour Browne, with the exception of Glasgow, related to quite small undertakings. As a matter fact, in the Walton-on-Thames and Weybridge Act of 1869, the Gas Company there had powers considerably beyond those of the Mitcham and Wimbledon Act, for they seemed to give the Company the right to set up as coal and lime merchants; but whether they had ever acted upon it he did not know. As to the Glasgow Act of 1910, in his opinion exactly the same question arose upon the construction of that clause as in connection with the construction of clauses in other Acts—namely, whether it really authorized the manufacture of residual products purchased from other undertakings. The word "purchase" did not occur. The words were "deal in;" but the question was not raised throughout the whole inquiry on the Glasgow Bill. The Model Bill for 1913, however, had words inserted in it to bring it into conformity with the South Suburban clause; and this satisfied the alkali manufacturers.

The CHAIRMAN: The clause put forward by the Alkali Manufacturers' Association allows the purchase of materials by a gas company for the working-up of their own residual products?

Witness: Yes.

As I understand, the Model Bill as it now stands does not allow a gas company to buy from another gas company sulphuric acid for the purpose of manufacturing sulphate of ammonia that was subsequently sold. They would then be selling a thing which was not made entirely from residuals of gas manufactured by them.

Mr. FITZGERALD: I do not think that is so.

The CHAIRMAN: The only point is, Do you ask for the larger restriction which, in my view, the Model Bill clause contains, or do you ask for the smaller restriction which your clause contains?

Mr. FITZGERALD: I did not notice any difference. The words of the Model Bill are "may, on the said lands, manufacture and convert all residual products resulting from the manufacture of gas by them." If for the purpose of converting residual products resulting from the manufacture of gas by them they have to buy something else, they may buy it.

The CHAIRMAN: But they cannot sell the product that is then produced. That is my point.

Mr. FITZGERALD: But I think they can. I do not see anything to prevent it.

The CHAIRMAN: Because they are not selling a product which is produced by their residuals entirely.

Mr. FITZGERALD said that, in his opinion, the gas company could purchase whatever was necessary for the purpose of carrying on a conversion of their own residual products.

The CHAIRMAN: Very well. I only wanted to see what your contention was.

Mr. BALFOUR BROWNE: I do not think they can sell anything which does not result from the manufacture of their own residuals.

The CHAIRMAN: I confess that is my opinion on the construction of the words; but the construction of the words is not so important as Mr. Fitzgerald's contention. [To Mr. Fitzgerald, and referring to the Model Bill:] Is this the sort of restriction that you suggest to the Committee should be inserted in future Bills?

Mr. FITZGERALD: Yes; but I do not like to bind myself actually to the words and to say they are perfect words. My own view has been that the words introduced into the Model Bill effect in a simpler way the same purpose as Lord Ritchie's clause.

Under further re-examination, witness drew attention to the fact that the Wandsworth Company had accepted the chemical clause this session.

In reply to Mr. THORNE, witness maintained that limiting the power to buy would reduce competition to some extent. On the other hand, to allow free competition of the sort desired by gas companies would make it irresistible. The chemical manufacturer would then have no chance. The effect on the market of what the alkali manufacturers propose would be almost inappreciable.

By Mr. ROBERTS: He did not agree with Sir Harry Samuel's decision that it might be advantageous for small companies to combine for manufacturing their residual products. As he had shown, small companies could quite well look after themselves.

By Mr. LARDNER: If it were necessary for small companies to combine, they should do it by means of an undertaking working separately from the statutory gas undertaking.

Mr. LARDNER: Then you do agree with Sir Harry Samuel's report to some extent?

Witness: Nothing could prevent them now from putting up plant the same as an ordinary chemical manufacturer does.

DR. RUDOLPH MESSEL'S EVIDENCE.

Dr. *R. Messel* (a Director of Messrs. Spencer Chapman and Messel, Limited) agreed with all the views expressed by the previous witness as proving that gas-works were the main source of sulphate of ammonia. He said that in coke-ovens the gases were passed direct through sulphuric acid, as it did not matter whether the illuminating power of the gas was destroyed. Thus ammoniacal liquor was not formed. In other works which operated upon old-fashioned methods and produced ammoniacal liquor, the coal to begin with was washed, and it contained so much moisture that the liquor was too dilute. To be made at all useful, it would have to undergo a process of concentration, which was too costly. A certain quantity of sulphate of ammonia was produced in iron-works; but it was not available for chemical manufacturers, nor was the ammonia produced in shale works. Producer gas and carbonizing works also made sulphate of ammonia; but no ammoniacal liquor was available. If the gas companies were allowed to carry on their works in the way they suggested, a large number of chemical manufacturers would be prevented from carrying on a certain portion of their business. There was strong competition for ammoniacal liquor when it came on the market.

In cross-examination by Mr. BALFOUR BROWNE, witness said that his own firm would not be affected by gas companies doing as they desired; but a large number of the members of the Alkali Manufacturers' Association would be very seriously interfered with.

Mr. BALFOUR BROWNE: Suppose all the small companies put up plants to deal with their ammoniacal liquor, what would become of the chemical trade?

Witness: We should either have to stop or get our ammoniacal liquor from abroad at a very much greater cost.

Do you not think that if you want ammoniacal liquor, you should pay a fair market price for it?—Undoubtedly.

Do you know the way to get a fair market price is free competition; and this is exactly what you want to prevent. Why should you restrict gas companies from selling to other companies. Is that free competition?—No, it is not.

I take it that in the market the fewer people I have competing for the article I want, the better for me?—Undoubtedly.

And that is the result of what this restriction would be—you purchasers in the market would have fewer people competing with you?—I do not quite follow.

Mr. BALFOUR BROWNE: If the Committee do, I do not care whether you do or not.

In answer to further questions, witness expressed the opinion that the whole matter had been settled by the decision of Select Committees this session, and he did not think there was any necessity for appointing a Joint Committee. Alkali manufacturers were quite satisfied with what had taken place before the other Committees.

Mr. BALFOUR BROWNE: But apparently Parliament was not satisfied, because they have appointed this Committee to go into the whole subject.

In answer to a few questions by the Committee, witness said he did not know how many small companies had installed plants for dealing with their own liquor; but any chemical manufacturer purchasing their sulphate of ammonia would send his own tank-trucks for removing it from the gas-works.

In answer to the CHAIRMAN, witness said he did not know whether the price of ammoniacal liquor was fixed by a combination of buyers.

Wednesday, Nov. 27.

On the resumption of the proceedings this morning,

The CHAIRMAN asked Mr. Fitzgerald how many more witnesses he had, and how long he would be before he finished his case.

Mr. FITZGERALD said that he had about six more witnesses; but their evidence would not be lengthy; and the Committee could rest assured that his case would conclude to-day.

MR. R. G. PERRY'S EVIDENCE.

Mr. *R. G. Perry* (a Director of Messrs. Chance and Hunt) was the first witness called this morning. He said the firm was registered in 1908, and had a capital of £280,000. They had taken over the Oldbury Alkali Company, Limited, and Messrs. W. Hunt and Sons, Limited, and now had works at Oldbury, Wednesbury, Stafford, Birmingham, and in South Wales. The particular manufactures carried on by his firm were alkalis, ammonia, and acids. They employed 1400 to 1500 workmen; and their weekly wages bill was £2500. His firm were members of the Alkali Manufacturers' Association. The raw materials required were largely obtained from gas-works; and they had contracts with 60 different gas-works in the United Kingdom. For some of the processes they were entirely dependent on gas-works for raw materials; and if they were debarred from obtaining ammoniacal liquor from this source, the firm would be unable to continue a large proportion of their present business. Ammoniacal liquor was used as a raw material for the manufacture of ammonia salts, which were used in many forms of trade, such as the galvanizing of sheet iron, dyeing processes, &c.; and any restriction of the supply of ammoniacal liquor would seriously affect these industries. Any stoppage of the supply in this country would result in the British consumer having to be supplied from Germany or other Continental countries. Chemical manufacturers had laid down very expensive plant for dealing with these chemicals; and this large expenditure had been incurred by private individuals because of the custom of gas-works, up to a comparatively recent period, of always selling their liquor. If this practice were to end, as seemed possible, the expenditure of capital on these works would be lost, as the plant was practically useless for any other purpose. At the present time, and for some months past, it had been well-nigh impossible for his Company to obtain sufficient ammoniacal liquor to enable them to manufacture the products which they had to sell. There was, in fact, a serious shortage at the moment, and his firm and another for which he was authorized to speak had been compelled to refuse orders for which they had been unable to obtain sufficient raw material, and which they would have been only too glad to execute.

The CHAIRMAN: What are your chief sources of supply?

Witness: Gas-works; and we are actually buying from sixty to-day.

Are most of these small gas-works?—They vary in size. We will buy ammoniacal liquor from anywhere we can get it.

What length of contract do you have?—Sometimes for two, three, four, or five years, and I have known cases of seven years.

Continuing his examination-in-chief, witness referred to the statements which had been made that certain small gas companies have been unable to find a market for their liquor, and said that he would be very pleased indeed to have the names of those who were suffering this hardship. He would certainly do his best to buy from them if he could obtain their names. He was now buying liquor in South Wales, concentrating it at his own expense at his works there, and transporting it to his other works in different parts of the country. He associated the present difficulty in obtaining liquor with the gas-works manufacturing chemicals and purchasing among themselves; and in this connection he instanced the case of the Coventry Corporation. Some of the contracts which the Corporation had entered into for purchasing ammoniacal liquor had been held by his firm until they were outbid by them. The Coventry Corporation also purchased spent oxide from other gas-works, and from this they were manufacturing, or rather attempting to manufacture, very large quantities of sulphuric acid. Quite recently the Corporation had entered into a contract to supply not less than 7500 tons of sulphuric acid over a period of years in direct competition with his firm, and with other private acid makers. Owing to the favoured position of gas undertakings, they were able to offer a higher price for the liquor than could be offered by the chemical manufacturer, who had to apportion the whole of his standing charges to his chemical business. A gas undertaking, on the other hand, covered its standing charges by the revenue from the supply of gas. If gas companies were to be allowed to purchase liquor from other companies, this would tend to create a practical monopoly in the supply—in fact, it would place in the hands of a gas undertaking a dual monopoly, one for the supply of gas and the other for dealing in chemicals. It had been suggested that there were other sources of supply available apart from gas-works; but he maintained that there were, for all practical purposes, no others. It might be possible from time to time to procure very small quantities of liquor from elsewhere; but these were so small as to be valueless for the purpose of conducting ammonia works. It was impossible to rely upon these extraneous sources of supply, and orders which had been refused by English firms owing to the lack of a supply of liquor had been carried out by American makers. English chemical manufacturers were in daily competition not only with American makers, but also with German, French, Italian, and Russian, especially in ammonia products. A few years ago, anhydrous ammonia, which was entirely used for refrigeration, was manufactured by several English firms; but now the manufacture was solely in the hands of the Gaslight and Coke Company, apart from that which came from abroad, which was about 25 per cent. of the total consumption. At the present time, considerable quantities of ammonia products were being imported into England by Continental makers; and owing to the scarcity of the raw material—ammoniacal liquor—in England, the English makers could not successfully compete with these foreign firms. In order to maintain effective competition with the foreigners, it was vital that the supply should be maintained. The usual practice was that if the gas companies happened to have a contract with a chemical manufacturer which was working smoothly and satisfactorily, they continued it. In many cases, gas companies refrained from putting up their supply to public auction, and preferred to rearrange the contract with their private contractor. The usual custom was to sell on a sliding-scale—*i.e.*, the price quoted by the chemical buyer was based upon the current market price of sulphate of ammonia; and it rose and fell according to a scale as the market price of sulphate of ammonia rose and fell, and was in step with it. Thus the gas company eliminated any speculation in the matter—the private trader took all the

risk. There was not a vestige of truth in the suggestion that there was a "ring" for controlling prices.

In cross-examination by Mr. BALFOUR BROWNE, witness admitted that his firm made sulphuric acid from pyrites which was imported largely from Spain and other places. They bought a small quantity of spent oxide from gas-works. On the question of the absence of competition if the gas companies were allowed to deal in their own residuals, Counsel suggested that as there were over 1000 gas-works, it was a simple matter for a chemical firm to pick and choose between them, if he could not get the liquor at his price from one of them. It was also put to witness that sulphate of ammonia was produced by gas-works, shale-works, and coke-ovens, and that 67 per cent. of the total sulphate of ammonia manufactured in this country was not produced by gas-works; but he said he was not aware of this. Bearing on the point made by witness that the capital spent by private firms on sulphate plants might be rendered obsolete if the gas companies had their own, it was put to him that the South Metropolitan and Commercial Companies both had these plants; and if the alkali manufacturers had their way, these would have to be scrapped. Witness replied that these were only two cases, while there might be fifty cases of private traders. He agreed that he wished to prevent competition on the part of gas undertakings by their manufacturing articles from residuals not produced from gas made by them.

Mr. BALFOUR BROWNE: If small companies put up plants, as was suggested yesterday, you would be deprived of obtaining liquor?

Witness: We should.

How is it worse for you if I manufacture my own liquor, or I sell it to neighbouring gas-works and they manufacture it?—We should be worse to this extent—the second gas company having a double supply of liquor would thereby manufacture ammonia products which it would not be able to manufacture with its own.

That is, manufacturing on a larger scale would enable them to produce more cheaply?—A combination of a number of gas companies together, centralizing their ammonia products on one site, is just what we are doing our best to prevent.

Combination of gas companies you object to; but you yourself are the result of combination?—I do not follow that.

In answer to further questions, witness said that he had only mentioned the case of anhydrous ammonia to show the sort of competition private manufacturers had to contend with on the part of gas companies, even when they were dealing with their residuals, which he could not very well object to.

Mr. BALFOUR BROWNE: Therefore, the question with regard to anhydrous ammonia has no connection with this inquiry, nor has the question of competition from abroad.

Witness replied that competition from abroad had a bearing in this way. On the Continent generally, and in Germany in particular, it was the custom for small gas companies to erect small, cheap, and efficient concentration plants for concentrating ammoniacal liquor and reducing its bulk in order to cheapen the cost of carriage and enable the German chemical manufacturer to get a supply more easily and more cheaply. The result was that the German was able to make ammonia salts more cheaply than we could here; and he could thus compete with us.

Mr. BALFOUR BROWNE: If a gas undertaker has a surplus of ammoniacal liquor, do you say that he should not be allowed to purchase sulphuric acid to make up the balance?

Mr. FITZGERALD: No, no, that is not the case I have ever put on behalf of the alkali manufacturers. In the clause which we propose, you can purchase anything you like provided that it is for the purpose of working up your own residual products.

The CHAIRMAN: Under Lord Ritchie's clause, I understand that a gas company can buy from another gas company sulphuric acid for the purpose of manufacturing sulphate of ammonia from their own alkali, and can sell the sulphate so obtained. Mr. Fitzgerald told me yesterday that he would not pledge himself to the words; but that was substantially the sort of restriction he intended to ask the Committee to impose.

Mr. BALFOUR BROWNE: I follow that; but if the converse is the case, and the undertaker has a surplus of sulphuric acid, I take it he should not be allowed to purchase in order to work up the balance of his sulphuric acid. [To witness:] Is that your position?

Witness: Yes.

Mr. FITZGERALD: Sulphuric acid is not a residual product.

The CHAIRMAN: It seems to me rather a metaphysical distinction. [To witness:] You say you ought not to be allowed to reverse the process?

Witness said that was his contention, because ammoniacal liquor was a residual product of gas manufacture and sulphuric acid was not.

In answer to a question by Mr. BALFOUR BROWNE with regard to a "ring" for keeping up prices, or districting different parts of the country, witness admitted that there had been cases in which undue competition and over-production had been corrected with a view to regulating the output of sulphuric acid. The object of this, he said, was not to keep up the price, but to prevent the evils of undue competition. His experience was that undue competition generally resulted in the production of an inferior quality.

Mr. BALFOUR BROWNE: And also produced a lower price?

Witness: Probably.

And you say this is entirely in the interests of the consumer, to keep up the excellent quality of the acid?—Partly.

Do you know that many small companies turn their liquor into drains or streams because they cannot find a buyer?—I did not know.

Mr. FITZGERALD: Will you give us the names?

Mr. BALFOUR BROWNE: As witness does not know the fact, it is no good. One company has had to buy a field to pour their liquor on.

Mr. FITZGERALD: If these things are put to the witness, they should be made specific by name.

The CHAIRMAN: I assume that Mr. Balfour Browne intends to call evidence to bear out the statement put to witness. In these circumstances, the question is perfectly fair; and since witness cannot say that he knows of these cases, I think we can very well wait until Mr. Balfour Browne calls his witnesses.

Mr. FITZGERALD: If the name is mentioned now we can test it; but, if it is only put when my friend calls his witnesses, we shall not have much opportunity of doing so.

The CHAIRMAN: I will see that you have plenty of opportunity.

Mr. BALFOUR BROWNE next asked witness if he knew that the Manchester Corporation had set up a sulphate of ammonia plant, and that chemical manufacturers had offered a large sum of money to the Corporation if they would not do so. Witness replied that he was not aware of this, although he had heard of the installation of the plant. Another point put by Counsel was that chemical companies could themselves secure their raw material by distilling coal; but witness said this could not possibly be a commercial proposition, as they would not have any means for disposing of the gas.

In re-examination, it was stated that the price of ammoniacal liquor had gone up enormously to the advantage of gas-works during recent years, and that even with the clause proposed by the alkali manufacturers there would still be formidable competition with the gas industry.

In answer to various members of the Committee, witness stated that the profit of his firm this year was considerably less than last year. This might be partly due to what the gas companies were doing, although he agreed that there were the coal strike and other things which had been contributory causes. He thought there had been from twelve to fifteen months serious competition, and was the thin end of the wedge. If the wedge was inserted, the English ammonia maker would have to go to the wall.

Mr. ROBERTS: You see the danger in front, and are asking the Committee to protect you against unfair competition?

Witness: Yes.

The CHAIRMAN: The only reason you call this a monopoly is that the gas company can quote a higher price for residuals than you can?

Witness: Yes.

And your case is that they can quote this higher price because their profits are made in the manufacturing and selling of gas, and that it is immaterial to them whether they get a trading profit on the residuals so long as they make something?—Yes, and also they can obtain their initial capital on much less onerous terms than a private firm.

When you speak of monopoly, what you mean is that they can quote a higher price for the reason I have stated?—That is so.

The CHAIRMAN: With regard to purchase from other companies, you raise no objection to the purchase by a gas company of the surplus sulphuric acid of another company for the purpose of manufacturing sulphate of ammonia?

Mr. FITZGERALD: That is my case. If a gas company want sulphuric acid for the purpose of working up their own ammoniacal liquor, they may purchase it wherever they wish.

The CHAIRMAN: I want to know on what point of principle you object to the converse—to the purchase by a company of ammoniacal liquor?

Witness: Because ammoniacal liquor is a raw material and a residual of gas manufacture; and if we chemical manufacturers cannot get it from gas-works we cannot get it anywhere else. Sulphuric acid, on the other hand, is produced very largely, and we could buy it from several sources.

You have two objections—that it restricts your market, and also that ammoniacal liquor is a residual in the sense that sulphuric acid is not. Is not this a question of degree?—No. Ammoniacal liquor is a direct residual from the production of gas, and sulphuric acid is the result of an operation that has been performed on spent oxide, which is a residual. It is simply one degree further removed.

I suppose the ammoniacal liquor itself has something done to it before it is sold as a residual?—Sometimes it is concentrated.

Then you do not complain of the purchase of sulphuric acid, because you say that it is used in the manufacture or in the working up of the purchasing company's own residuals?—That is exactly my case.

Lord INCHCAPE: You do not think that statutory companies should be allowed to interfere with private enterprise?

Witness: No.

MR. HUBERT FERGUSON'S EVIDENCE.

Mr. *Hubert Ferguson* (the Chief Chemist and Manager to Messrs. Burt, Boulton, and Haywood, Limited, who have works at Silvertown, Belgium, Bordeaux, and at Bilbao, in Spain) said that his firm distilled tar and made sulphate of ammonia. They purchased large quantities of crude tar and ammoniacal liquor in the United Kingdom direct from the gas-works or through brokers. Two-thirds of their purchases were made direct. The quantity bought in England had an annual value of about £90,000 per annum. He confirmed the evidence already given as to the demand for liquor being greater than the supply, and explained the sliding-scale upon which tar is purchased. The constitution of the tar varied considerably in different parts of the country, and also in the different works, depending on the coal used and the method of carbonizing. With the sliding-scale, the first thing to decide was the quality of the tar, the products it contained, and in what proportion. It was worked out on the basis that 1000 gallons of tar would yield so many gallons each of crude naphtha, creosote, and carbolic acid, so many pounds of anthracine, and so many tons of pitch. An arbitrator was appointed, who decided upon the monthly values of the tar. The arbitrator was usually a merchant in the trade, and every month he gave a certificate showing the value of the crude naphtha, &c. An amount was allowed for working expenses, and a small margin left for profit. The manufacturer agreed to remove the tar as and when it was required. As a rule, he was only entitled to take the surplus tar—though this was a somewhat elastic term—and leave the gas-works free to supply to others so long as it was not another tar distiller. From the valuer's report, the account for the tar supplied during the month was made up. In this way, the gas authorities took no risk, as was explained by the previous witness. Taking the figures from "Field's Analysis" for 1909-10-11 for the three Metropolitan Companies, he said that the value put down per gallon for the tar was 1·27d. in the case of the Gaslight and Coke Company, 1·4d. in the case of the South Metropolitan Company, and 1·41d. in the case of the Commercial Company. It was curious that the latter Company had

the highest price, although they did not distil their tar; whereas the Gaslight and Coke Company, who did, had the lowest. He assumed that in each case they had deducted from the amount set down as having been received for the tar the cost of manufacture; but he had an idea that the fixed charges, such as rent, rates, depreciation, insurance, management charges, &c., were lumped into the general account for gas making and distribution, and that only the labour and cost of chemicals bought from outside were entered against the sales. The figures showed the same relation for the following years, 1910-11; being, respectively, Gaslight and Coke Company 1·52d. and 1·85d., South Metropolitan Company, 1·47d. and 1·70d., Commercial Company, 1·67d. and 1·91d. The result again was that the Commercial Company, who sold their tar direct to the distiller, did better than the others.

The CHAIRMAN: That is the amount at which the tar stands in the Company's books, and you are comparing a figure which is the actual amount received from a real sale in the case of the Commercial Company with what are more or less hypothetical figures in the other two cases?

Witness said he did not know whether this was the case; but in the last half-year's accounts of the Gaslight and Coke Company they seemed to have put down the whole of the expenditure in relation to tar with the general gas account. There was no reduction even for labour, as there was in the case of coke and breeze sold.

Continuing his examination-in-chief, witness expressed the opinion that the manager of a small gas-works was not qualified to act as manager of a chemical works, as when he had devoted all his energies to the making and distribution of gas he did not have much time left to deal with residuals. As a matter of fact, in the very small works the manager was stoker, collector, manager, and everything else. A larger amount of sulphate of ammonia was sent abroad by English makers than was sold in England for fertilizing purposes. He put it down to the proverbial want of foresight on the part of the English farmer that he did not use more sulphate of ammonia for fertilizing purposes. The sum received for tar and ammoniacal liquor per 1000 cubic feet of gas sold by the Gaslight and Coke Company in 1911 amounted to 3·36d. In his opinion, if they had sold their residuals they would have received more than this. Even if the price received for the residuals had not exceeded the figures in the Company's books, they would only have sacrificed the manufacturers' profit of (say) 10 per cent. of this 3·36d., which would affect the consumer to the extent of one-third of a penny per 1000 cubic feet.

Mr. BALFOUR BROWNE, in his cross-examination, pointed out that this one-third of a penny per 1000 cubic feet was no less than £40,000 a year on the Company's income. Witness, however, replied that it was unimportant compared with the total income of the Company. After having denied a suggestion that an arrangement had been made by his Company with another that one should buy on the north of the Thames and another on the south only, witness admitted that in the tar trade about eight or nine years ago there was a distinct combination for the purpose of forcing-up the prices of anthracene. All the manufacturers held up the market; and the Gaslight and Coke Company, although they could not openly come into it, winked at it. This went on for several years; but eventually it broke down because German makers were able to get their supplies elsewhere, and were undercutting, and the stocks had to be sold for what they would fetch. Witness was also questioned as to whether, in 1903, his firm refused to take ammoniacal liquor from the Ascot Company. A letter was read, in which it was explained that his firm tendered to the Ascot Company for both ammoniacal liquor and tar, and that as their tender for tar only was accepted, and the quotation had been based upon both products, they declined to be bound by it. Counsel also put to witness the fact that the Kent County Surveyor had been driven to buying crude tar from local gas-works, and treating it in boilers at his depôts owing to the high prices charged by tar distillers. In conclusion, he got witness to admit that residuals should be employed to the best possible advantage, and that if they could be used to the best possible advantage in the hands of gas-works, so much the better for the people of the country.

Mr. FITZGERALD re-examined witness on this point, and obtained the answer that when he said residuals should be utilized to the best possible advantage he meant by converting them into the higher class chemicals, which gas-works were unable to do.

Mr. BALFOUR BROWNE interposed with a few further questions in respect to the Hornsey Gas Company, who are prohibited from working up their own products. He pointed out that the best price this Company can obtain for their residuals is £3 for the ammonia from 100 tons of coal used—the ammonia having to be removed by railway. Witness agreed that if the Company could work up their own residuals, £10 per 100 tons of coal used could be obtained. Counsel also pointed out that if Hornsey were allowed to sell their liquor to a neighbouring company they would be assured of £5, instead of the £3 paid by a private chemical firm at present.

MR. WILLIAM SHORT'S EVIDENCE.

Mr. *William Short* (General Manager of the Purchasing Department of the United Alkali Company, Limited) said they employed 3000 or 4000 men. He confirmed the opinions already expressed as to the increasing difficulty of obtaining ammoniacal liquor, and said that if gas-works were to extend their chemical operations to include the manufacture of ammonia soda, it would be serious for everybody.

In cross-examination, witness said there were 44 companies comprised in the United Alkali Company, and that the present capital was £8,000,000. At Fleetwood, his Company were carbonizing coal for its yield of ammonia. At Widnes, they produced a small quantity of liquor from a coke-oven installation. Experimental beet growing was being carried out in Norfolk by Dutchmen; and if it were a success, there would be a large sale in this country for sulphate of ammonia for this purpose. The dividend last year of his Company was only 2 per cent. on the ordinary shares, and the average over the last five years was about 1 per cent.

Mr. BALFOUR BROWNE immediately put the question that therefore the fall in dividends was not due to any recent action on the part of gas companies, and to this witness assented.

Mr. LARDNER asked witness his opinion as to what should be done in the case of a number of small gas-works which were too far removed from chemical manufacturers to make it profitable to sell their liquor. The reply was that he could not admit the principle of allowing even these gas-works to combine among themselves. Moreover, he could not imagine a gas-works so small that they could not turn their liquor into sulphate of ammonia. As a matter of fact, his Company only acquired ammoniacal liquor from three works—namely, Widnes, Fleetwood, and Bristol.

MR. C. E. MUSGRAVE'S EVIDENCE.

Mr. *C. E. Musgrave* (the Secretary to the London Chamber of Commerce) gave evidence as to the action of that body with regard to this matter, and read the resolution passed at a meeting of the Chemical Trades Section early in the year. The London Chamber of Commerce took the matter up in regard to the Wandsworth Bill, and were satisfied when a clause similar to the Ritchie clause was inserted.

MR. SIDNEY MARTIN'S EVIDENCE.

Mr. *Sidney Martin* (the Secretary to the Association of Coal-Tar Distillers) also spoke to his Society being officially interested in this matter.

MR. A. W. COCHBURN'S EVIDENCE.

Mr. *A. W. Cochburn* (the proprietor of the Cooper Chemical Company at Manchester) said the Company were consumers and dealers in sulphuric acid. His firm were not members of the Alkali Manufacturers' Association, nor of the Coal-Tar Distillers' Association. He had heard all the previous evidence, and entirely agreed with it. Dealing with a specific matter, he said that for six years prior to 1912 his firm had supplied Messrs. Courthall and Co., silk manufacturers, of Coventry, with all the chemicals they required in connection with their business, including sulphuric acid to the extent of 1600 tons per annum. In September last year, however, the Coventry Corporation quoted this firm for acid at a figure 20 per cent. less than his contract, which was at the market price. In order to retain the contract, however, and keep his other trade with Messrs. Courthall together, he quoted a price within 2½ per cent. of the Corporation price, and got the business. Then his firm offered to take all the sulphuric acid the Coventry Corporation could make, and entered into a contract in February, 1912, under which the Corporation agreed to sell him all the sulphuric acid made at the Coventry Gas-Works which was not required by the Corporation for their own use. The amount was not to exceed 1500 tons, nor to be less than 750 tons, per annum for five years from 1912. Notwithstanding this, however, no acid had been supplied at the strength provided for. The reason for this was that they had not been able to put down a satisfactory plant; and in reply to his repeated applications for supplies, he was told that the plant was not working properly. The Corporation also had a concentrating plant which did not work satisfactorily, and which at the present time was being pulled down and another erected in its place. This was a very unhappy instance of municipal trading. Municipalities were not constituted to have the necessary knowledge to manufacture properly or to deal properly with the sale of chemicals; and incidentally this injured chemical manufacturers.

Mr. BALFOUR BROWNE, in his cross-examination, obtained the admission that Messrs. Courthall and Co. had benefited by the competition between his firm and the Corporation. Witness added, however, the proposition both of the Coventry Corporation and of his own firm to supply the sulphuric acid at the lower price was not a commercial one. He had done it to retain his other business with the firm. So far as the supply of sulphuric acid from the Corporation to his firm not being up to standard was concerned, he knew he had his remedy in the Law Courts under breach of contract; but he had merely mentioned it as an instance of how unsatisfactory it was to put these commercial matters in the hands of a corporation.

This closed the case for the Alkali Manufacturers' Association.

The Case for the Gas Undertakings.

Mr. BALFOUR BROWNE, addressing the Committee, remarked that he was in a difficulty. The Committee had said they would follow the ordinary procedure of a Private Bill Committee. Of course, if this were a Private Bill, he would have no right to address the Committee now, and also sum up his evidence. The rule in Parliament was that Counsel for the opponents to a Bill should only have one speech, and if the Committee were going to adhere strictly to this, he would proceed at once to call his evidence. If, on the other hand, it would be convenient to the Committee, he would rather like, in opening his case, to say how he proposed to meet the case against him, and then afterwards to sum up the evidence.

The CHAIRMAN, after consulting with his colleagues, said the Committee were of the opinion that Private Bill Procedure should be followed, and that Mr. Balfour Browne should restrict himself to one speech.

MR. CORBET WOODALL'S EVIDENCE.

Mr. *Corbet Woodall*, the Governor of the Gaslight and Coke Company, said the proposal made by the alkali manufacturers was that Parliament should limit the trade of gas companies in favour of a combination of private traders; but he saw no rational ground upon which this could be asked. The effect would be to create a monopoly in the hands of certain traders in opposition to a so-called monopoly, which was not monopoly, of the gas companies, who were regulated, limited, and controlled by Parliament. On the other hand, the monopoly proposed to be set up would be under no restriction of any sort. Gas companies were regulated in every possible way in the interests of the public and of the gas consumers. Dealing in residual products was a necessity in the manufacture of gas; and in a great number of instances Parliament had gone quite beyond dealing in residuals, for in special cases gas companies had power to deal in fittings and other things. In fact, as had been pointed out in the course of the case, in one small instance a gas company had actually been empowered to deal in coal.

If a company had power to buy and sell residuals, he saw no reason why the power to sell should be taken away; and having heard much of the evidence before the Committee, he was still at a loss to understand what it was the manufacturers had to complain of in the manner in which gas companies had interpreted their powers. The present method of dealing with residuals inured to the benefit of the consumers of gas, and any restriction put upon them would at any rate check a fall in the price of gas, if it did not actually effect an increase. At one time or another, most gas companies had needed to purchase from one another and buy and sell between them; and this had proved an advantage all round. In some cases, it was absolutely essential to do it. An illustration of this was the Gaslight and Coke Company, who the other day were short of sulphuric acid, and were compelled to buy 200 tons. It would have been necessary to close-down the works unless this could have been purchased, and he was advised that the only concern who could let them have it was the South Metropolitan Gas Company. Mr. Ferguson's figures of comparison had been given to try and prove that the South Metropolitan and the Gaslight and Coke Companies, who made sulphuric acid, were worse off than the Commercial Company, who did not. This was not an easy thing to deal with, owing to the manner in which the accounts were made up. However, it was a fact that the revenue from tar products and sulphate of ammonia in the case of the London Companies, averaged about 3½d. per 1000 cubic feet of gas sold; and on the price charged by the Gaslight and Coke Company, this represented a considerable reduction.

The CHAIRMAN: But you cannot put the whole 3½d. against the cost of gas, because you must take off something for working expenses.

Mr. BALFOUR BROWNE: The 3½d. is the net figure, as the expenses have already been taken off.

The CHAIRMAN: Then the effect on the price of gas is between 3d. and 4d. per 1000 cubic feet?

Witness: Yes. Continuing, he said that similar figures applied to the other Suburban companies; and he believed that the large Provincial corporations were in the same position. Dealing with the small companies, he stated that many were only able to get a price for their liquor sufficient to pay for the carriage, and they had either to do this or run it to waste. This could be avoided by combination, which was possible under the present law—by the companies buying and selling between themselves. If this were prevented, it was conceivable that the gas-works would have to pay the alkali manufacturers to take the stuff away from the works. A free market was very necessary to the full success of a gas undertaking; while from the point of view of the consumer, it was absolutely essential, in order to obtain the best results for him. If the Committee were to report in favour of the restriction imposed, they would be putting restrictions upon the gas industry for the benefit of the alkali manufacturers, who would be under no obligations whatever. Dealing with the purchases made by the Gaslight and Coke Company during recent years from other gas-works, witness said they were very small indeed; and until this inquiry opened, he had no idea that the alkali manufacturers could be affected by them at all. There were certain occasions and certain circumstances under which purchasing was necessary. For instance, his Company had bought solvent naphtha in somewhat small quantities, in order to improve the quality of their tar, and enable it to comply with conditions made by the buyers. They had, in addition, bought 44,000 gallons of crude carbolic, 600 tons of spent oxide, and 100 tons of sulphuric acid, because of a stoppage in their own acid chambers. Among other things purchased had been 148 tons of spent oxide from the Lea Bridge Gas Company, and 22 tons of crude naphtha from Tottenham. These he thought were practically all the purchases made during five or six years. It would not, however, be the case in a small gas-works, when they could not work up all their residuals without applying to outside companies. They must have sulphuric acid. He was strongly in favour of the open market, where the prices could be regulated by free competition. He could not see where the alkali manufacturers had suffered at all by the operations of gas companies; or, if they had suffered, it was a very slight injury, and was only the natural result of ordinary trading, which they ought to be prepared to face. A certain amount of competition was good all round. With regard to Mr. Pearce's evidence that the manufacture of residuals was recent, witness pointed out that it had been going on for very many years, and he had on view in the committee-room a large number of bottles containing samples of chemical products made by gas companies, most of them having been made for the past twenty years, and others for a considerably longer period. The suggestion that gas managers were not fitted to carry on chemical manufacture was not a fact. The chemical part of the gas industry had always been quite an important one. Research chemists were constantly at work trying to find out new methods and new products, and generally a great deal of scientific work was carried out. Taking up the point in the evidence of the other side as to capital invested in alkali manufacturers' undertakings and the number of men employed, he said that on this basis the gas industry was deserving of far greater consideration. The capital invested in statutory undertakings amounted to no less than £135,000,000. The capital of the Gaslight and Coke Company alone was nearly £30,000,000; and as to wages, these amounted to £25,500 a week for his Company alone. Over 2,000,000 tons of coal were carbonized by the Company each year, and 13,000 men were employed. Thus what he might term the economic interest in the matter was very much greater in the case of the gas industry than of the chemical industry. He agreed that there were other sources of supply for raw material, and pointed out that it was becoming the practice with coke-ovens to work on the lines of gas companies, and to produce ammoniacal liquor instead of sulphate of ammonia direct. He could not understand the distinction which was drawn between allowing gas companies to buy sulphuric acid and refusing to allow them to buy ammoniacal liquor.

The CHAIRMAN: The first witness to-day drew the distinction very distinctly.

Witness: In my opinion, they are both residual products; and the result of the combination is sulphate of ammonia.

Mr. FITZGERALD, in cross-examination: You use the term residual product as being anything that could be manufactured from the residual products of gas manufacture?

Witness: Yes.

Whether that posseses the other things that have been referred to or not?—Yes.

Further questions were put to show that the gas industry was a highly protected one, and that the return upon the unconverted stock of the Gaslight and Coke Company was about 12 per cent. Counsel pointed out that the Beckton Gas-Works, which were erected in 1878, were being worked under a clause in the Company's Act of Parliament which contained terms almost identical with those proposed by the alkali manufacturers But witness said, the Company had been in Parliament a dozen times since that Act was passed, and nothing had ever been said as to the limitation which was now being put upon it. When it was contended that the Act meant that they could not buy or sell *inter se* between themselves, then he maintained that it was an important thing for his Company and for many others. He frequently wanted further supplies of ammonia to work up his surplus sulphuric acid. Having made sulphuric acid from his own products, he wished to be able to use it in the most profitable way.

Mr. FITZGERALD: And the most profitable way according to you is to enter into business as a chemical manufacturer?

Witness: We are already in that business.

Well, extend it then?—Whether we sell or whether we use it up it is much the same thing.

In further cross-examination, witness said he did not suggest that if the proposed clause was imposed upon the gas industry, the Gaslight and Coke Company would lose the benefit of the 3½d. per 1000 feet of gas sold at present derived from their residual products. He agreed that the effect, as things stood at present, would be limited, so far as his Company were concerned; but in the proceedings this session, no reference had been made to tar. He had remarked upon this, and had been puzzled to know why the action was being taken by the alkali people. He was still puzzled; but it was made a little clearer by the introduction of the tar question. He now felt that this action might easily extend to a wider range of interference with the gas industry; and this would impose a very great hardship upon the smaller undertakings. Counsel then pointed out that Birmingham, who sold their liquor, got more for their residuals than did the Gaslight and Coke Company, and, indeed, paid £60,000 a year in relief of rates. Witness replied that this might be so; but the comparison could not be made, owing to the difference in circumstances. At any rate, it was not in the best interests of the consumer that these large sums should be paid in relief of rates. The final cross-examining on questions to-day was as to whether the gas industry would allow alkali manufacturers to set up works in various parts of the country so as to produce ammoniacal liquor and at the same time enter into competition with the local gas authority in order to dispose of the gas from these works, to which witness replied that no doubt this would be resisted, but there was nothing to prevent it being done to-day.

Thursday, Nov. 28.

Mr. *Corbet Woodall's* cross-examination was resumed this morning. A long series of questions were put by Mr. FITZGERALD with regard to the Gaslight and Coke Company's capital, which witness had put in his evidence-in-chief as £30,000,000. Counsel pointed out that this was not the actual paid-up capital, but included the "watered" capital. Witness admitted that he had made a slip; and the matter was eventually cleared up as follows: The total stock and debentures amount to £27,882,000. In addition to this, there is £1,609,000 premium capital, bearing no dividend, making a total of £29,591,000. Of this, however, the amount added on conversion was £14,450,000, making an actual paid-up capital of something over £15,000,000. Counsel suggested that gas companies, if they carried their present contention to its logical conclusion, should also set up as coal merchants. But the answer was that, with the exception of one or two very small undertakings, this did not come within gas companies' parliamentary powers. Counsel pressed witness for instances where there was any extensive trading of the character referred to between gas companies, and cases were given him of the Gaslight and Coke Company purchasing from the Tottenham Company. It was admitted that generally the amount of business done was very small; but there had been no restriction. There were cases of emergency, however, where it became absolutely essential for gas companies to buy and sell among themselves. Witness could not say the value of the products which the Gaslight and Coke Company had purchased within the last few years. It seemed to him, he said, in answer to further questions, that the action of the alkali people would be grossly unfair to the small companies, who needed great care over their expenditure. Every bye-product which they could sell helped them in keeping down the price of gas. With regard to the purchase of 200 tons of sulphuric acid, referred to on the previous day, he had been informed from his office that they had applied to a number of firms in London; but they could not supply it, though one firm was good enough to lend them a small quantity. It would have been absurd to make inquiries all over the country for such a small amount. It was true that the Company had previously been selling sulphuric acid; but this was not the cause of the shortage, which was due to a breakdown on the works, and could not have been foreseen. Dealing with the manufacture of ammonia abroad by synthetic processes, witness did not agree that this was not being done on a practical scale. It was true that there were several processes in the experimental stage; but there were a large number in the practical stage carried on in Sweden, Norway, and Germany.

In re-examination, witness argued that to allow the gas companies to continue as at present would only cause chemical manufacturers to compete with the gas companies for the ammoniacal liquor produced from gas-works, and it would not affect other sources of supply, which he contended were plentiful. The movement on the part of the alkali manufacturers was, in his opinion, an attack, and not a defence. Most small companies were not near to chemical manufacturers, but were near to a larger gas-works, where a sulphate plant could be erected, and where all the liquor from the surrounding smaller works could be treated with advantage to all concerned. In his opinion, the words "by them," contained in the Gaslight and Coke Company's Act of 1868, were never intended to bear the construction which it was now sought to place on them. As a matter of fact, the Gaslight and Coke

Company had a later Act in 1876, in which these words were not included. With regard to the meaning of "residual products," both sulphur and ammonia were derived from the distillation of coal. The sulphur, in order to be turned into sulphuric acid, had to have something added to it; while ammoniacal liquor, before it could be put on the market, had to be cleansed and treated, and was in a sense a manufactured article. To this extent, they were both residual products of the manufacture of gas.

Mr. ROBERTS: Supposing Parliament gave you power to continue emergency purchases, which you have referred to, would not that meet your case?

Witness: To a certain extent, yes; but it would not meet the case of the smaller companies. I hope you will bear in mind that I have not throughout attempted to make this a very important matter for the large companies. But what I am afraid is that if interference is made with these occasional transactions it would be harmful; and I further strongly object to an industry like the gas industry being controlled in the interests of a body of wealthy manufacturers, who are very well able to look after themselves.

The CHAIRMAN: You said ammoniacal liquor was a manufactured article?

Witness: Well, that is hardly correct. It is an article produced in the manufacture of gas; but it is sold just as it is produced.

What I want to know is, do you sell it in the crude state in which it comes from the manufacture of gas, or does it go through any process before it becomes a commercial article?—No; It is supplied to the manufacturers just as it is produced, and would go through no process unless it were concentrated.

You have said that, so far as the big companies are concerned, they can carry on their business as they are now without any difficulty; but you are chiefly concerned with the small companies?—Yes; but I do not want to minimize the point that the necessity arises on occasions even with the large companies.

How far do you suggest that Parliament should go? You have told us you think a company ought to be allowed to purchase from another company either sulphuric acid or ammoniacal liquor for the purpose of working up their own residuals. Just take it a step further. Assuming you make sulphuric acid, would you consider a gas company justified in buying pyrites for the purpose of that manufacture?—No.

And therefore you do not put your case any higher than that a gas company should buy residuals or products of other companies for the purpose of manufacturing their own residuals or products?—Yes. Suppose, for instance, a company have an excess of sulphuric acid. I think, instead of being required to sell that to dealers, they should be allowed to buy liquor in order to use up their sulphuric acid. May I qualify what I said with regard to the purchase of pyrites? If the oxide of iron on the works does not produce a sufficient quantity of sulphuric acid for fixing the ammonia, that is, I think, the only reason we should have to buy pyrites and make the acid sufficient for our purpose.

You claim the right to make and sell various chemicals of which we have seen samples. How far do you think a gas company entitled to go? Would you feel entitled to make aniline dyes?—Yes.

And your view is that a gas company can carry manufacturing processes to any length, so long as it is profitable to the ratepayers or consumers?—Yes. In most cases I think it will be necessary to buy hardly anything outside; but if it is a question of buying things to make further use of our products, I think we should be allowed to.

And that you should be entitled to purchase any article that will enable you to make a profitable use of your residuals?—I do.

MR. CHARLES CARPENTER'S EVIDENCE.

Mr. *Charles Carpenter*, the Chairman of the South Metropolitan Gas Company, said that, in addition to powers to make gas, they had general powers with regard to residual products. The natural advantage of trading in residuals was one of the things held out by the promoters of the gas industry in the early part of the Eighteenth Century, in order to induce people to take an interest in it. He briefly detailed how the South Metropolitan Gas Company had developed out of an amalgamation of several companies, and how, though at first Parliament did not take kindly to the view of districting London, it had subsequently done so, and the results had been amply justified in the very cheap supply of gas which was now being given. The effect of a reduction of 1d. per 1000 cubic feet sold on the South Metropolitan Company's revenue represented a saving of £55,000 to the consumers; while the extra dividend which could be paid under the sliding-scale in view of such a reduction amounted to £8300. Thus it was much more a consumers' than a shareholders' question. Except from the point of view of the sliding-scale, Parliament, when it agreed to districting London, placed no other restrictions upon the trading operations of the Company. The products of gas manufacture were: (*a*) Coke, breeze, and clinker; (*b*) tar and ammonia water; (*c*) gaseous ammonia, hydrogen, cyanogen, and some other compounds. The South Metropolitan Company had spent about £250,000 upon plant for dealing with their residual products; and the income from this was as follows: In respect of (*a*) 6½d. per 1000 cubic feet sold; (*b*), 1½d.; and (*c*), 2½d.

The CHAIRMAN: Do you claim this 10½d. as a profit, and that it should come off the price of gas?

Witness: That is so.

You are sure about that, because it is nearly 50 per cent. of the cost of the gas?—Absolutely certain. It is the reason we are able to sell gas at the figure we do, and to compete successfully with electricity, in which there are no residuals to enable the price to be reduced.

Witness added that the 10½d. mentioned was net, after all charges had been put against the manufacture of residuals. Thus it would be seen that any serious interference with this business was a very important matter for the consumer. As an instance of the manner in which it was necessary in the gas industry to look to small matters with a view to economical management, he mentioned that incandescent mantle ash was collected and sold for working up into mantles again. His Company had tendered in the open market for tar produced by the South Suburban Company. As the latter gas-works were in a residential district, it was not possible to erect plant there for the distilling of the tar. For four or five years, Messrs. Burt, Boulton, and Haywood beat the South Metropolitan Company for this business; but this year the prices of both happened to be the same, and the Directors of the South Suburban Company divided the contract. At the same time, it was interesting to note that, before the Gas Company entered the lists, the prices obtained by the South Suburban Company were considerably lower. It was obviously a case in which open competition had resulted to the advantage of the consumer. He objected strongly to any restraint of the trade of gas companies in connection with their residuals; and though he could not say that any such restraint on the part of the alkali manufacturers existed to-day, yet in November, 1902, it certainly did exist, because Sir George Livesey, who was then Chairman of the South Metropolitan Company, had received a letter from a tar distiller of Manchester, who had expressed his surprise at the low prices which the gas companies were obtaining for their tar, and had said that the tar trade in England had for many years regulated the price so that the gas companies should only receive very poor prices. Taking up the analogy mentioned by Mr. Fitzgerald between the gas industry and railways—viz., that railways were not allowed to carry on, for instance, a coal business—witness pointed out, on the other hand, that railways were allowed to do anything and everything that was incidental to the carrying on of their business. For instance, they were allowed to have hotels, which, by the way, were not restricted to passengers on the particular railway owning them. They also ran steamboats, motor-buses, &c. The reason why there was a difference in the price obtained for the tar by the two London Companies working up, compared with the one Company in London who did not work up, was explained by witness by the fact that the company not working up had at once felt the increase in the market price of tar, whereas the companies who manufacture had previously given forward contracts, so that it would be a little time before the effect was felt. If this factor were eliminated, it would be found that the Commercial Company, who had no works, were not getting such a good price as the companies who did. The largest purchase of tar made by the South Metropolitan Company was 1,000,000 gallons; and this was about one-tenth of the total quantity which they themselves produced on their own works. All this was purchased from the South Suburban Company. It was quite the common practice for gas companies where there was a large consumption of coke to produce more than was needed for their own use and to sell to their neighbours; but if the principle of the chemical clause were applied to all residuals, this would be prevented. If the chemical manufacturers were to be protected in the way they desired, it would be equally logical that coal and coke merchants should be protected against the gas companies selling coke. He disagreed with the view that gas-works were the only source of supply for ammoniacal liquor, as there were many millions of gallons being made in iron and steel works and coke-ovens in this country, as had already been stated by other witnesses. He knew, for instance, in the Durham district, Messrs. Bolckow, Vaughan, and Co. and many other works where ammoniacal liquor would be available if a fair price were offered for it. In addition to Durham, there were the Staveley Iron Company and the Grassmoor Company, and, in South Wales, the whole of the ammonia there was produced in the form of liquor, and not by direct absorption by sulphuric acid. Witness handed in a table showing that from 1905 to 1911 the private chemical makers were always asking and obtaining higher prices than the market price for sulphuric acid. During this time, the South Metropolitan Company were also quoting; but owing to their not having a plant which made acid of the strength required by the South Suburban Company, their prices were always higher than those of the private maker. In 1911, however, their new plant got to work, and they were able to quote a price which secured the contract from the South Suburban Company, which was greatly to the advantage of the latter. Another table was handed in to rebut the views which had been expressed that the chemical trade is naturally of a very speculative nature. The table showed that materials required for ordinary gas manufacture undergo similar fluctuations in price to those experienced by chemicals. Thus, it was argued, trading in residuals is no more speculative than gas manufacture itself. As a matter of fact, during the past twenty years the fluctuation in the price of coal has been more considerable than has the fluctuation in the prices of ammonia, sulphuric acid, and tar. Quite apart from the working-up of residuals, gas manufacture involved the employment of a highly organized chemical staff, whose services were also available in connection with residuals; and it would be an unfortunate thing if any interference were made with the staffs, which were doing good work in enabling the price of gas to be so considerably reduced. As an instance of giving gas-works free play in this matter, he mentioned that at the time of the Boer War the export of carbolic acid was prohibited, because it was a substance which, when nitrated, made picric acid, which was used for making lyddite. The private chemical manufacturers of the country were not able to produce sufficient carbolic acid, and a supply had to be obtained from Germany and worked up here. If gas companies were encouraged to make full use of their opportunities in this direction, this state of things was not likely to happen again. Similarly, witness expressed the opinion, in connection with coal-tar dyes, that if the gas industry had been as fully alive forty years ago as it is to-day, this industry would not have been lost to Germany in the manner it was. The endeavours of the gas undertakings now to get the most out of their raw materials was a thing which should be encouraged, and not discouraged.

In cross-examination, witness said that the South Metropolitan Company had purchased residuals from, among others, the gas companies at Bournemouth, Leatherhead, Luton, Lewes, Colchester, Richmond, and also from the South Suburban Company. He believed at present that they were not purchasing from any company. They had only bought oxide of iron during the present year from Richmond; and the order was for 200 or 300 tons. He knew that on one occasion the Richmond Company could not get a fair quotation for sulphuric acid—one firm refusing to quote against another. It was not the practice of the South Metropolitan Company to buy ammoniacal liquor; but during the past six years there had been times when as much as 4000 tons

of spent oxide had been purchased from other gas companies, and he agreed that under the proposed clause he would be able to buy as much spent oxide as he desired. They had only bought tar from the South Suburban Gas Company. This practice began three or four years ago, since he became Chairman of the Company. Previous to that, the Chairman of the South Metropolitan and the South Suburban Companies was the same person—viz , the late Sir George Livesey, who up to a certain point had not found it necessary to purchase tar from the South Suburban Company, For many years Sir George Livesey held the opinion that gas companies had enough to do to manufacture gas, and that the arrangements made with various chemical companies were fair. But year by year Sir George Livesey, in the last twelve years of his life—and he could speak of this from personal knowledge—arrived at the conclusion that gas companies were not being treated fairly by the chemical contractors; and that was the reason why he (Sir George Livesey) first of all took steps to get the production of ammonia salts in his own hands, then the production of sulphuric acid, and then the distillation of tar. At the present time, the South Metropolitan Company were in an abnormal position with regard to the amount of oxide of iron. They were not producing nearly enough for their requirements, and this accounted for the fact that they had temporarily commenced to use lime for purification. But as soon as they got their own plant to work, which would enable them to dispense with the use of lime, they would produce much more sulphur than was necessary to make sulphuric acid for the purpose of their own ammonia. Counsel suggested that during ten years the Company had only bought 690 tons of spent oxide; but witness said that this did not include the spent oxide purchased from other people than gas-works. He admitted that he had never purchased ammonia from iron-works or coke-ovens; but he knew that it was made there. The only disadvantage was that the liquor contained less ammonia than the liquor which was specially made for the purpose. In reply to a question as to chemical manufacturers having to rely on gas-works, witness replied that it seemed unfortunately to be true that a large section of the chemical trade did not know the possibilities in their own industry. If they did, we should not be in the hands of the Germans as much as we are to-day. The final question was with regard to the suggestion to Sir George Livesey by a tar contractor that there was a "ring" to maintain prices, and witness said that the result of this was that the Company purchased a tar-works which had been erected on land owned by them.

In answer to questions by the Committee, witness said he was not prepared to say that if Parliament carried out the policy suggested in Sir Harry Samuel's decision on the Annfield Plain Bill—viz., to allow small companies to combine in this matter—it would meet the case. Such a policy would certainly hit his Company very hard, because they had expended a considerable sum of money and had built up a business relying on the purchase and sale of residual products. He had no fear whatever that the chemical manufacturers would lose their market. The chemical industry was a very fluctuating one—one product lost a market, and it was immediately followed by a market being found for a new product. Chemical manufacturers were always turning their hands to something else. They had already lost the ammonia salt trade; and it was not impossible that electrolytic processes for the manufacture of soda would supersede the ammonia soda process. Certainly the fears of the chemical trade that their business as a whole would be seriously affected were undoubtedly exaggerated. It seemed to be thought that the gas industry desired to enter into business as general chemical manufacturers; but they had never had this intention. But as regards their own particular raw materials, he claimed the right of being able to do the best they possibly could for themselves, whether it be large or small.

The CHAIRMAN: Do you say that the Company are entitled to buy pyrites to make sulphuric acid for sale?

Witness: We claim that right. My view is that it might be essential that we should buy pyrites because we could not get spent oxide. That is a very unlikely contingency; and I am quite willing to rule-out pyrites if necessary.

Do you claim the right to go into the market as producers and sellers of sulphuric acid except from your own residuals, or would you buy from other companies?—Yes, I accept that limitation provided it can be so worded; and that I fear is the greatest difficulty, in preventing any case of hardship arising. My view is that we should be in the position of being able to supply the requirements of any gas company in respect of their residuals, and that it should not be necessary for any gas company to be compelled to go to an association of ammonia manufacturers for anything they may require for the purpose of their business.

Do you think gas companies ought to be able to produce and sell products such as aniline dyes?—I believe the Gaslight and Coke Company do so to-day, and I do not see any reason in the world why they should be prohibited.

Then you think a gas company ought to be able to follow the process of production down to the most finished article which its residuals produce?—If it is practicable and economical, and in the interests of gas consumers. There should be no limitation to the work carried on by a gas company in this way, if it is to the advantage of gas.

MR. H. E. JONES'S EVIDENCE.

Mr. *Harry Jones*, the Chairman of the Gas Companies' Protection Association, said that this body regarded the proposed restriction with the very greatest apprehension, especially as during the proceedings before the Select Committees this session some sort of definite conclusion was apparently being come to. The decisions in the South Suburban case and on the Bills before Sir Harry Samuel came as quite a surprise to the industry. He wished to emphasize the fact that it was not merely a question of shareholders or dividends, but that it had a large public side. The London Gas Companies, for instance, supplied an enormous number of very poor people, who would be seriously affected, as had already been shown by Mr. Carpenter; while in addition, in the case of the South Metropolitan Company, the workmen had a very large profit-sharing scheme, which would be interfered with by any alteration in the conditions under which the undertaking was now managed. At present, the workman got nearly 7 per cent. upon his wages; but if the price of gas had to be increased for any reason, his share in the undertaking would go down, and certainly the proposed restriction would tend to affect the price. As an instance of the economies to be made by working-up the residuals, he mentioned that in the case of the Commercial Company sulphuric acid, which they now made for a total cost of 18s. per ton, at one time cost 30s., when purchased from private makers. All companies could do equally well out of their residual products. Even under the restricted powers of the Wandsworth Act this year, it was possible for the Company (with which he was connected) to put up a sulphuric acid plant; and though he did not wish to inflict another acid plant upon Wandsworth, he would do so rather than pay fancy prices for the acid. Until gas companies began to work-up their residuals, they never realized the full value of them. At one time ammoniacal liquor only fetched 2s. per butt, whereas now it was worth 6s. to 7s. Similarly, the return per ton of coal from this material was now 2s. 6d. compared with 5d. many years ago. The same thing had happened with the tar. Explaining Mr. Pearce's figures, from which it was endeavoured to show that the Commercial Company, who sold their tar, got a higher price than the Gaslight and Coke Company and the South Metropolitan Company who worked their tar up, witness said that many years ago, when the Commercial Company proposed to go into the tar business, Messrs. Burt, Boulton, and Haywood offered a very favourable sliding-scale contract for fifteen or sixteen years, which induced him to reconsider the proposal to put up a tar-works; and that was the reason why the Commercial Company did not work up their tar. This was a very attractive contract, and he probably would not have got such terms in more recent times. With regard to the higher profit obtained by the Commercial Company on their ammonia and tar, compared with the other companies who worked theirs up, witness also explained that this was due to the fact that it included not only the profit made on tar and ammonia *per se*, but profit on the sulphur materials supplied to other companies. If small companies had the right to treat their own ammonia and not deal with the big companies, it would close the best market on both sides. He was in favour of small companies in outlying districts sending their liquor to larger gas-works such as, taking Kent, those at Faversham or Ramsgate, and having it treated there. But this portion of the business should be in the hands of a separate company, financed with separate capital, as he foresaw possibilities of abuse in the hands of the larger companies upon whom the smaller ones would have to rely for their market. It might be that the small companies under these circumstances would not get the best price. He certainly agreed that tar should be dealt with in the district in which it was produced for the benefit of the road authorities, who now had a very large demand for it. Curiously enough, tar was not wanted so much in London where the distillers were, but in the country away from the distillers. As an instance of the economy to be effected, he mentioned that the Surveyor at Epsom had made it worth while for the gas-works there to partially distil the tar sold for road purposes, with the result that it was sold to him at 2½d. per gallon, against 4d. per gallon which had previously to be paid for it in London. The Epsom Company had purchased the ammoniacal liquor of the Leatherhead Company for many years at a very much better price than could have been obtained elsewhere; but since the Leatherhead Company put up their own sulphate plant, this had ceased. As the proposed clause was drawn, it might be said to contain a restriction upon the sale of coke from one company to another—a practice which was very common, owing to the particular circumstances of different gas companies. The Wandsworth Company agreed to the chemical clause being put into their Bill on the understanding that they had the right to raise the matter subsequently. [This is disputed by the Parliamentary Agents for the Alkali Manufacturers' Association; and the correspondence which took place concerning it has been placed before the Committee.]

In cross-examination, witness agreed that, judging by results, the Wandsworth Company were the most successful of all the companies in the London area, yet they did not buy ammoniacal liquor, tar, or spent oxide from outside sources. He also agreed that all the companies with which he was connected were highly successful ones, but added that one of the reasons was that he knew where to buy cheap acid—*i.e.*, from other gas companies. Even so, it was a profitable business for the companies from whom he purchased, for the Wandsworth Company bought acid from the Watford Company at 21s. per ton which cost the Watford Company 18s. to manufacture. He agreed that he had gone into competition with all the other makers of sulphuric acid, and added that he had set apart a portion of the land belonging to the Wandsworth Company for a sulphate plant, and was also inclined to go in for tar distillation. Witness mentioned two small companies of which he is practically the proprietor—viz., at Loddon, near Norwich, and Chilham, in Kent—in both of which cases the liquor had to be wasted.

The evidence with regard to these two companies created considerable amusement. Witness referred to them as his hobbies, and refused to tell Counsel how the ammoniacal liquor was wasted, because, he remarked, "you may be troublesome." The fact was that the carriage on the liquor for a distance over 5 miles from the works would render it unprofitable to sell it, and, so far as the Loddon works were concerned, he was in hopes of making arrangements with the Beccles Gas-Works. The spent oxide he was accumulating in both cases, and hoped to dispose of later. The tar produced at both works was sold locally for roads.

In connection with this part of his cross-examination, witness mentioned other companies who were in a similar position, and was pressed for names by Mr. Fitzgerald. He said, however, that he had no definite knowledge, although he knew generally of these works; but a subsequent witness would deal with the matter.

Mr. FITZGERALD protested strongly to the Committee against this method of giving evidence, and witness produced a list of the companies, and, as an act of courtesy, handed it to Counsel for his inspection. He, however, refused to give evidence upon the list, as he did not know the details.

A long argument then took place with regard to a suggestion by Counsel that he should retain the list. Although he pleaded with the

Committee for a long time to do so, it was decided that, as it formed part of another witness's evidence, it must be returned to Mr. Jones.

Mr. BALFOUR BROWNE said he would call a witness to prove the list of names the first thing on Tuesday morning.

Mr. FITZGERALD: Just to prevent me seeing it.

The CHAIRMAN remarked that he did not think that Mr. Fitzgerald was any worse off than any other Counsel cross-examining a witness, as it was not the practice to hand the opposition documents before they had been proved before the Committee.

In re-examination, witness expressed the opinion that the Wandsworth Company would make more profit if they worked up their own residuals.

MR. H. P. MAYBURY'S EVIDENCE.

Mr. *H. P. Maybury*, the Kent County Surveyor, was called to give evidence as to the saving which had been made by him in the purchase of tar for road purposes direct from gas-works, compared with the charges previously made by tar distillers. The Kent County Council have made arrangements with certain gas companies in their area to combine for the purpose of distilling the tar from the various works, with a view to its being used for road purposes; the inducement being the promise of long-term contracts. Last year, in consequence of this action, the County Council saved £3123. Orders had been given for 1,146,000 gallons directly to the gas-works, and 500,000 gallons indirectly.

The CHAIRMAN having suggested that this evidence hardly bore directly on the point before the Committee, Mr. Balfour Browne said the point was, if combination of gas companies were prevented, public authorities would have to pay an increased price for their tar; and this would be a burden on the ratepayers.

The CHAIRMAN said what the Committee felt was that this evidence was showing the evils which might exist at the present time, and not particularly the state of things that might result if a restrictive clause were passed; and this was opening up rather a wide inquiry.

Mr. BALFOUR BROWNE said he thought the Committee had embarked upon a wide inquiry. He was merely speaking of what might happen in the future. This Council had saved £3123 last year, and would not be able to save any such sum next year if this prohibition were put upon gas companies.

The CHAIRMAN said the matter should be confined to the question of combination and how it affects the price.

Mr. BALFOUR BROWNE said he wanted to show that a tar distiller had threatened Mr. Maybury, which indicated that a "ring" existed.

Mr. FITZGERALD protested against this being introduced into the inquiry if the gentleman in question was not going to be called.

In reply to the CHAIRMAN, witness explained that a member of a tar distilling firm called upon him and seemed very grieved because the Kent County Council were purchasing tar from the works in the way he had described. He told the tar distiller that he was not going to pay fancy prices, and mentioned that arrangements were being made with the larger gas companies for putting down dehydrating plant. The tar distiller thereupon threatened to do all he could to stop this, also to report the County Council to the Inspector under the Alkali Act. Witness added that the conversation was a friendly one.

The CHAIRMAN said that, in view of the last remark, he thought the conversation was a purely business one, and that it was not desirable to pursue the matter further.

The Committee then adjourned until to-day (Tuesday).

NOTICES GIVEN FOR BILLS (SESSION 1913) RELATING TO GAS, ELECTRICITY, AND WATER SUPPLY.

[SECOND LIST.]

Aberystwyth Corporation.—The Corporation of Aberystwyth wish for further powers with regard to the water supply, and for authority to lay down a main from the Plynlimon reservoir. Provision will be made in the Bill for the extension of the area of supply so as to include several places in the county of Cardigan, and also for raising the necessary money.

Birmingham Corporation (Gas and Water Sinking Funds).—In a General Powers Bill to be promoted by the Birmingham Corporation, they will ask for authority to employ any moneys in the sinking fund established for the redemption of gas annuities in the purchase and extinction of water annuities, and any moneys in the water annuities sinking fund in the purchase and extinction of gas annuities. All necessary provisions will be made for the adjustment of accounts between the gas and water undertakings.

Bishop's Waltham Water.—The Bishop's Waltham Water Company, Limited, will apply for authority to sell their undertaking to the South Hants Water Company, and for the confirmation of any agreement which may have been entered into by the two Companies in this respect. The purchasing Company will require power to use certain lands of the Bishop's Waltham Company and the works thereon, and to apply their funds for the purpose.

Bradford Corporation.—The Corporation of Bradford require power to construct a storage reservoir on the River Nidd and also two aqueducts. The water limits will be defined in the Bill; and the Corporation will ask for the exclusive right of supply within the area specified, with the exception of Shipley, in which parish a supply is only to be given with the consent of the Urban District Council. More money will be needed.

Broadstairs and St. Peter's Urban District Council.—A General Powers Bill of which notice has been given by the Council will contain several provisions in regard to water supply. The meaning of the words "domestic purposes" will be defined; and authority will be sought to exclude from the expression any particular purpose. The other provisions are of a general character.

Brumby and Frodingham Urban District Council.—Power will be sought by the Council to purchase the portion of the gas-works and plant of the Scunthorpe Urban District Council in the Brumby and Frodingham districts, and to supply gas within the district and in the parish of Ashby. The Council also requires authority to construct gas-works—the supply of gas to be continued by the Scunthorpe District Council until their completion; and to raise the necessary money.

Coventry Corporation.—Application will be made by the Corporation of Coventry for a revival of the powers conferred on them by their Act of 1907 for the construction of a service-tank adjoining an existing reservoir, authority for obtaining an additional supply of water from the Corporation of Birmingham, and an extension of the limits of gas and electricity supply. Permission to borrow more money will be required.

Derby Corporation.—A General Powers Bill for which notice has been given by the Derby Corporation will contain provisions for altering and increasing the existing charges for water and for the better carrying-on of their water undertaking; also others with regard to the supply of electricity. Authority will be sought for raising more money.

Epsom Urban District Council.—Application will be made by the Council for authority to levy additional charges for water, sell it by measure, define "domestic purposes," provide for the payment of rates by owners instead of occupiers of small houses, supply fittings, and make general provisions in regard to the supply of water.

Heathfield and District Water.—Authority will be sought for the incorporation of a company for the supply of water to certain parishes, or portions thereof, in the county of Sussex. It is proposed that the intended company should acquire the undertakings of the Ticehurst and District Water and Gas Company and the Heathfield and District Water Company, Limited; and power will be applied for to enter into the necessary agreements with the owners of these undertakings and with local authorities or other persons.

Huddersfield Corporation (Water Supply).—The Huddersfield Corporation intend to apply (*inter alia*) for authority to purchase the reservoir and other works belonging to the Deanhead Commissioners, situated in the parish and urban district of Scammonden, in the West Riding of the county of York, and to make and maintain an aqueduct or pipe-line commencing at the outlet of the reservoir, and terminating in the parish of Lindley-cum-Quarmby. Provision will be made for the dissolution of the Commissioners, and the transfer of their property to the Corporation, for the protection of millowners and others, and for the construction of additional works of distribution, &c. Permission is required to raise more money.

Leicester Corporation (Gas Reserve Fund, &c.).—The Corporation of Leicester require authority to increase the amount of their gas reserve fund, and to alter the limit imposed upon the amount of the fund by section 36 of their Gas and Water Transfer Act, 1878, as amended by a Provisional Order granted in 1891; and to amend the Act and Order so far as may be necessary for the purpose. The Corporation also wish to be enabled to pay out of the district fund or rate, or any other fund or rate which may be specified in the Bill, expenses incurred by them in relation to any associations of municipal corporations or other local authorities.

Liverpool Corporation.—In a General Powers Bill to be promoted by the Liverpool Corporation, authority will be sought to enter into agreements with the Corporation of Chorley for the supply of water in that borough, and settle the terms and conditions on which it is to be afforded and the charges to be made. Parliament will be asked to confirm and give effect to any agreemeut which may be concluded prior to the passing of the Bill, and to make further provision in regard to the application of the Chorley water account. The Chorley Water-Works Transfer Act, 1856, or any other Act relating to the supply of water in the borough, is to be amended or repealed. Further borrowing powers will be required.

London County Council (Lamp Brackets, &c.).—In a General Powers Bill of which notice has been given by the London County Council, authority will be sought to empower the Metropolitan Borough Councils to attach to buildings, for the purpose of public lighting, brackets, pipes, wires, lamps, and apparatus, and to make incidental provisions with regard thereto.

Lymm Urban District Council.—Authority will be sought by the Council for the purchase of the undertaking of the Lymm Water Company, and for the confirmation of any agreement which may have been entered into in this respect by the two parties concerned. It is proposed to include the parish of Warburton in the area of the Council; and if this should be granted, the powers of water supply of the North Cheshire Water Company in respect of the parish will cease, and the Council's gas-supply limits will be extended. Provision will be made for the supply of both commodities in bulk, and for the raising of the necessary capital for the purposes indicated, as well as for others to be specified in the Bill.

Morley Corporation.—The Corporation of Morley will apply for further powers with reference to their gas and water undertakings. The notice sets forth that they wish particularly for the repeal of "any statutory provisions whereby a test of the illuminating power of the gas supplied is imposed," and to substitute for it "a test of the calorific value of the gas." With regard to water, they are desirous of having a definition of what is not included in a supply for domestic purposes, and of providing for a revision and an increase of their rates and charges, the closing of polluted wells, &c.

Mynyddislwyn Urban District Council.—Power will be applied for by the Council to acquire compulsory portions of the gas undertakings of the Risca and Bedwellty Urban District Councils and the Blackwood Gas Company, and to supply gas within the Sirhowy Valley portion of their district. It is proposed to ask for the repeal of certain powers of the Abercarn Urban District Council and of the Rhymney and Aber Valleys Gas and Water Company to supply gas. The Bill to be promoted, which is a general one, will contain the usual provisions with reference to gas supply; and permission will be required to raise the necessary money.

Northampton Corporation.—The Corporation of Northampton intend to apply for an extension of their limits of water supply so as to include the parishes of Guilsborough, Coton, and Hollowell, in the rural district of Brixworth, in the county of Northampton, and for authority to construct additional works, consisting of an impounding and a service reservoir and three aqueducts or pipe-lines. Further

power will be required with respect to the water undertaking, and also authority to raise more money and suspend payments into the sinking fund.

Nottingham Corporation.—In a Bill to be promoted by the Nottingham Corporation mainly to obtain power to construct further tramways, carry out street improvements, &c., they will ask for the amendment of a number of Acts relating to their gas and water undertakings.

Pontypridd and Rhondda Joint Water Board.—Authority will be sought for the confirmation of an agreement made by the Board with the Merthyr Tydfil Corporation for the supply to the Board of water in bulk, and for power to construct four aqueducts. It is proposed to ask for the amendment of the Pontypridd and Rhondda Water Act, 1910, in regard to the supply of water by the Board to the Llantrisant and Llantwit Fardre Rural District Council, and for sanction to an increase in the rates and charges. Permission to raise more money will be required.

Porthcawl and District Gas and Electricity.—The Porthcawl Gaslight and Coke Company, Limited, will seek to be dissolved and re-incorporated with power to supply gas in a defined area, and to establish a generating station and works for the supply of electricity within that area. The Bill will include all the provisions incidental to the supply of gas and electricity, the accounts in connection with which are to be kept separate. It is proposed to ask for the repeal of so much of the Llynvi Valley Gas Act, 1868, as relates to the supply of gas to Newton Nottage, in the county of Glamorgan, so to allow of that place being supplied by the Company. Power to raise more capital will be required.

Rochford Rural District Council (Water-Works Transfer).—Authority will be sought by the Rochford Rural District Council for the sale of their western district water undertaking to the Southend Water Company, whose limits of supply it is proposed to extend so as to include a number of places in the rural district. Permission will be asked in the Bill for the Company to apply their capital for the purpose of the purchase, and also to raise more money.

Slough Gas.—The Slough Gas Company intend to apply for an extension of their limits so as to include parts of the parishes of Langley Marish, Horton, and Burnham, in the Eton rural district and the county of Buckingham. The two first-named places are in the area of the Uxbridge Gas Company, and the last is in that of the Maidenhead Company. The present capital is to be consolidated, and more will be required. Provision will be made for altering the prescribed burner for testing gas, and for reducing its illuminating power. The Bill will contain a number of miscellaneous provisions in regard to the Company's affairs, including the appointment and remuneration of officers, the making of superannuation allowances, and the payment of pensions.

Titchfield Gas.—Application will be made for the dissolution of the Titchfield and District Gas and Lighting Company, Limited, and the incorporation of a new Company to acquire the undertaking. It is proposed to extend the existing works and construct new ones. The limits of supply are the parishes of Titchfield, Sarisbury, Hook-with-Warsash, Botley, and Curdridge, all in the county of Southampton. The Company will ask for the repeal of those parts of the Gosport Gas Company's Acts of 1865 and 1908 which apply to any portion of their area. The Bill will contain the usual provisions incidental to the manufacture and supply of gas and the raising of capital for the purpose.

Tynemouth Gas.—The Tynemouth Gas Company have notified their intention of applying for an extension of their limits of supply so as to include the urban districts of Earsdon and Seaton Delaval and the portion of the parish of Hartley now included in the urban district of Whitley and Monkseaton, all in the county of Northumberland. The Bill will contain, in addition to the usual provisions, others in regard to a co-partnership or profit-sharing scheme and the disposal of securities and moneys held thereunder; the appointment, dismissal, and remuneration of officers and servants; superannuation and other allowances; provision of workmen's dwellings; subscriptions to institutions; the supply of power gas, &c.

West Bromwich Corporation.—In a General Powers Bill of which the West Bromwich Corporation have given notice, authority will be sought to make further provision with regard to the gas and electricity undertakings. They comprise (*inter alia*) the quality, pressure, and testing of gas; exemption of the Corporation from liability to penalty for sulphur compounds other than sulphuretted hydrogen; free supply of burners, stoves, and fires; show-rooms and advertisements; construction and placing of pipes, &c., between mains and meters; and power to enter premises and remove fittings. The necessary financial provisions will be included.

Westgate and Birchington Gas and Electricity.—Application will be made for authority to change the name of the Westgate and Birchington Gas Company to that of the Westgate and Birchington Gas and Electricity Company, or such other as may be defined in the Bill, and to incorporate with the intended Act the Companies Clauses Act, 1863. It is proposed to include within the Company's limits the parish of St. Nicholas-at-Wade and parts of the parishes of Wood (otherwise Acol) and Westgate-on-Sea not now comprised therein. The Bill will contain provisions relating to the testing of gas and the prescription of a new burner; the production, storage, and supply of electricity throughout the Company's area, and the construction of the necessary generating station and works; the supply of gas and electric energy in bulk beyond the limits; and the raising of the necessary capital for the purposes of both branches of the business.

PROVISIONAL ORDER APPLICATIONS (SESSION 1913).

Board of Trade, under the Gas and Water Works Facilities Act, 1870.

Alresford Water.—The Alresford Water Company, Limited, will apply for authority to continue, extend, and maintain works and supply water in the parishes or parts of the parishes of Alresford (New and Old), Bishop's Sutton, Tichborne, Cheriton, Bramdean, Obington, Itchen Stoke, and Ropley, in the rural district of Alresford, in the County of Southampton. The Order will contain the usual provisions in regard to the supply of water.

Bagnalstown Gas.—Application will be made by the Bagnalstown (Co. Carlow) Gas Company, Limited, for authority to maintain and continue their works; make and supply gas in and about Bagnalstown; manufacture, deal in, and otherwise dispose of, residual products; break-up roads and streets for mainlaying purposes; and raise additional capital.

Dronfield Gas.—The Dronfield Gas Company intend to apply for authority to construct and maintain additional works, for which further borrowing powers will be required. It is proposed to modify the Order of 1879 with respect to the testing of gas, substitute a new burner, and make other provisions and regulations in regard to the supply.

Faversham Gas.—Authority will be sought for an extension of the limits of supply of the Faversham Gas Company so as to include a number of parishes in Kent, and for the exercise of the Company's existing powers in the enlarged area. It is proposed to acquire the undertaking of the Boughton Blean Gas and Coke Company, Limited, construct additional works, and make further provisions in regard to the quality and testing of gas and the supply of gas through prepayment meters. The purchase price of the undertaking named is to be paid out of the Company's existing capital.

Hawkhurst Gas.—The Hawkhurst Gas Company, Limited, require authority to construct gas-works on certain lands specified, and to apply their existing funds for the purpose. They wish to make further provision in regard to the laying of pipes in streets not dedicated to the public use, and to the quality, pressure, and testing of gas. Additional capital will be needed.

Kibworth Gas.—The Kibworth Gas Company, Limited, will apply for power to maintain, continue, and construct gas-works, conduct their existing gas undertaking, and supply gas in Kibworth and other parishes in the county of Leicester. More capital will be required; and authority will be sought for the formation and application of reserve and renewal funds and funds for special purposes.

Mexbrough and District Water.—Application will be made by the Mexbrough and District Water Company, Limited, for authority to raise additional capital, acquire certain lands by agreement, make general provisions in regard to the supply of water in the ordinary way as well as by measure and in bulk, provide for the discharge of water into streams, and frame bye-laws for the prevention of waste.

Midsomer Norton Gas.—Authority is required by the Midsomer Norton Gas Company, Limited, to acquire lands, construct additional works, and raise further capital. It is proposed to adopt the No. 2 "Metropolitan" burner for testing the illuminating power of the gas.

Penistone, Thurlstone, and Oxspring Gas.—The Penistone, Thurlstone, and Oxspring Gas Company intend to apply for an extension of their limits of supply so as to include the urban districts of Gunthwaite, Ingbirchworth, and Hoylandswaine and the townships or parishes of Thurgoland and Hunshelf, all in the West Riding of the county of York. The Order will contain provisions in regard to the quality and testing of gas, its supply in bulk, &c. It is proposed to change the name of the Company to that of the "Penistone and District Gas Company."

Portsmouth Water.—The Portsmouth Water Company intend to apply for authority to extend their limits of supply so as to include the parish of Portchester, in the county of Southampton, or some part thereof, and to exercise therein their existing powers, and make provision for preventing and detecting waste of water.

Redditch Gas.—The Redditch Gas Company require authority to erect, maintain, and use works for the manufacture and storage of gas and residual products on certain lands described, in addition to those specified in the schedules to the Company's Act of 1899 and Order of 1906. They will also ask for permission to raise additional capital, and for further powers in respect of their undertaking.

Silloth Gas.—The Holme Cultram Urban District Council require authority to buy the gas undertaking of the North British Railway Company at Silloth, and supply gas within the parish of Holme Low and other parts of the urban district of Holme Cultram. The Order will contain the usual provisions in regard to the manufacture and sale of gas and residual products, and the supply of meters, fittings, &c. Power to raise further capital will be applied for.

Topsham and District Water.—Application will be made by the Topsham and District Water Company, Limited, for authority to continue and maintain works and supply water in the parishes or parts of the parishes of Topsham, Clyst St. George, Woodbury, and Lympstone, in the rural district of St. Thomas, in the county of Devon.

Truro and District Electric Lighting.—The Truro Gas Company have given notice of their intention to apply for power to supply electric energy within the city of Truro and the parishes of Kea, Kenwyn Rural, St. Clement Rural, the detached portion of the parish of St. Erme adjoining the last-named parish, and the Manor of Tregavethan, in the rural district of Truro. The Company will ask for authority to use their lands for the purpose of a generating station; to open roads, streets, &c., for the purpose of laying down lines; to make charges for electrical energy, and to refuse to supply it or gas in certain cases; to transfer the undertaking to any company, body, or person; and to apply their capital and other moneys to the purposes of the Order.

West Staffordshire Gas.—Authority will be sought by Mr. W. E. Pickering, of Stafford, trading under the name of the Brewood Gas Company, or by a company about to be incorporated under the name of the West Staffordshire Gas Company, Limited, for authority to maintain and continue gas-works, and supply gas in the parishes of Brewood, Lapley and Wheaton Aston, Stretton, Church Eaton, Gnosall, Haughton, and part of the parish of Blymhill, in the county of Stafford, purchase lands, lay down mains and pipes, and levy rents, rates, and charges.

Wey Valley Water.—Authority for the construction of new works, consisting of a well or wells and a pumping-station in the parish of Frensham, in the county of Surrey, will be applied for by the Wey Valley Water Company, who also require further general powers in regard to water supply, meters, fittings, and apparatus, and permission to apply their funds and raise additional capital.

Local Government Board, under the Public Health Act, 1875, and the Gas and Water Works Facilities Act, 1870.

Biddulph Gas.—The Biddulph Urban District Council will apply for power to purchase the undertaking of the Biddulph, Bradley Green, and Black Bull Gas Company, Limited, and maintain, continue, and enlarge the existing works and plant. Authority will be sought (*inter alia*) to prescribe the illuminating power of the gas and the method of testing it; and the Council will ask to be exempt from penalty for inadequacy of pressure, insufficiency of illuminating power, or excess of impurity. More money will be required.

Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

Airdrie Corporation Gas.—Application will be made by the Airdrie Corporation for an extension of their limits of supply so as to include the parishes of New Monkland, Shotts, and Bothwell, or some or one of them, or some parts thereof, and for authority to supply within the extended limits gas for lighting and other purposes, on terms and conditions similar to those prevailing within the existing limits, or on such others as the Corporation may determine or the Order may define. It is proposed to reduce the illuminating power of the gas, and to make new and further provisions for testing both gas and meters. Additional borrowing powers will be required.

Dundee Boundaries.—The Corporation of Dundee wish to extend their boundaries so as to include the burghs of Broughty Ferry and Monifieth and portions of the county of Forfar. Should the scheme be sanctioned, all the Acts, powers, and privileges of the Corporation will apply to the added area.

Dunfermline District Water.—Power will be sought by the Dunfermline District Committee of the County Council of Fife to construct additional water-works, consisting of a reservoir in the county of Perth, another in the county of Fife, and an embankment, two aqueducts, and an access road in the former county. The Committee require authority to enter into agreements with other local bodies for the supply of water in bulk and for other purposes; also to extend, amend, or repeal agreements entered into between them and the Corporation of Inverkeithing, as set forth in schedules to the Dunfermline District Water Order of 1904. Borrowing powers will be required for the County Council.

Kirkcaldy and Dysart Water.—The Water-Works Commissioners of Kirkcaldy and Dysart require authority to extend and improve their water-works, and construct and maintain others, comprising enlargements of their Ballo, Holl, and Arnot reservoirs, four aqueducts, and filters near the existing filter-house beside the embankment of the Holl reservoir. Provision will be made for the prevention of the pollution and waste of water and of interference with mains and other works. Borrowing powers will be required.

Lanarkshire (Middle Ward) District Water.—Application will be made by the District Committee of the Middle Ward of the county of Lanark for power to construct additional works, consisting of a storage reservoir, a service reservoir, and a number of aqueducts and road diversions. It is proposed to abandon the Glengavel reservoir; and the Committee will ask for a reduction of the compensation water and for a release from other obligations relating to the reservoir. Authority will be sought for an extension of the water limits, and for the repeal of the power of other authorities to supply within the added area. Domestic supply is to be defined; and the provisions of Water Acts relating to the domestic water-rate are to be repealed or amended. The Committee require authority to carry out schemes of afforestation, and to raise more money for the general purposes of the Order.

St. Andrews Burgh Extension and Links.—The Corporation of St. Andrews desire authority to extend the boundaries of the burgh, and to make general provisions with regard to the supply of water in the annexed districts. Confirmation will be sought for a water-main already laid, and permission to make a deviation with another main. Borrowing powers will be required.

Plymouth Water-Works.—In his annual report to the Corporation, Mr. F. Howarth, Engineer of the Plymouth water undertaking, states that the income for the twelve months ended March last amounted to £34,692—an increase on the previous year of £651. The dry summer had a marked effect on the income from trade and shipping supplies and supplies in bulk to outside authorities; an increase of £987 being obtained from these sources. The total cost of upkeep and management was £10,448, which was £142 less than the previous year. The gross profit was £24,244; and after allowing £15,689 for interest, sinking fund, and income-tax, there was a net profit of £8554 in aid of the rates, or £1547 more than the previous year. The expenditure on capital account was £1109. The total sum borrowed on capital account up to March last was £399,180, of which £141,629 has been repaid. The consumption of water last year averaged 6,375,000 gallons per day, which was equal to 44·5 gallons per head of the population.

A Mysterious Gas Explosion.—An inquest was held last Tuesday at Ilminster on a painter named Frederick Baker, who died from the effect of injuries sustained in a gas explosion. Deceased had been working with other men in the renovation of an empty house, and on the evening of Oct. 31 left the premises after turning out the gas. Subsequently, the owner of the house went over it with a lighted candle, to see how the work was progressing. Everything was then apparently all right. Early next morning, the painters resumed work, and Baker went into a room which had a chandelier. On his striking a match, there was a violent explosion, which blew out the window, set fire to some wall paper, and burnt the man on the face and hands. According to the evidence of the owner of the premises, when he left the house on the night of Oct. 31, the chandelier was pushed up, and the window in the room was open. Baker could give no explanation of the cause of the explosion, but told his friends that he had turned off the gas at the chandelier on the previous night. The Jury returned a verdict of "Accidental death."

LEGAL INTELLIGENCE.

LAND RESERVED AS GATHERING GROUND FOR WATER-WORKS—"BENEFICIAL" OCCUPATION.

HOUSE OF LORDS.—Nov. 21 and 22.

(*Before the* LORD CHANCELLOR, *the Earl of* HALSBURY, *and Lords* ATKINSON *and* SHAW.)

A Judicial Committee of the House of Lords, composed as above, were engaged in hearing an important appeal by the Corporation of Liverpool against an order of the Court of Appeal in favour of the present respondents, the Assessment Committee of the Chorley Union and the Overseers of Withnell.

Mr. BALFOUR BROWNE, K.C., Mr. MACMORRAN, K.C., and Mr. OULTON appeared for the appellants; while Mr. DANCKWERTS, K.C., Mr. RYDE, K.C., and Mr. GORDON HEWART, K.C., represented the respondents.

Mr. BALFOUR BROWNE explained that the Corporation were the owners and occupiers of a system of reservoirs and water-works known as the Rivington Water-Works. They had appealed to Quarter Sessions against a poor-rate for the township of Withnell made on April 27, 1909, wherein they were assessed in respect of the water-works at a rateable value of £3672, and a further sum in respect of certain other hereditaments. As to the last-named assessment this had been abandoned; and their Lordships would not be troubled with it. It had been agreed between the parties that an assessment of £2507 (part of the £3672) should be taken to be £2400. The only question, therefore, apart from the costs, was as to an assessment of £1165 rateable value, which was in respect of land forming part of the gathering-ground of their water-works.

The LORD CHANCELLOR: The whole point we have to decide is whether the Corporation are or are not in rateable occupation of this gathering-ground.

Mr. BALFOUR BROWNE replied that this was the whole question. The Quarter Sessions had found as a fact that, with the exception of the part used for nurseries and plantations, the appellants did not occupy, and had no intention of occupying, these 1165 acres of land. The question was raised for the opinion of the High Court by a special case. Shortly, the facts were these: A large area of moorland was purchased by the appellants and reserved as a gathering-ground or water-trap for their water-works. To obviate all chance of pollution of the water so gathered, the Corporation had removed all farmhouses and buildings and live stock, and allowed the land to be untenanted, and, excepting that part of the land was utilized as plantations and nurseries for young growing timber, it was used for sporting purposes only. The tenant to whom they had let the sporting rights was separately assessed in respect of them.

Lord HALSBURY: The same question, I suppose, of beneficial occupation and liability to rates?

Mr. BALFOUR BROWNE: Yes. In this case, the Court of Appeal held that the Corporation had such reservation and use of the gathering-ground as a whole as to render them beneficial occupiers liable to be rated to the poor-rate. The facts were stated in a special case; and on these facts three questions of law arose. First, were the Corporation in such occupation of the land as made them liable, as "the occupier," to be rated to the poor-rate? Quarter Sessions had held they were not; but on appeal the Divisional Court and the Court of Appeal had held that they were. The second question was as to the rate the nurseries and plantations, which occupied roughly 300 acres out of a total area of 1165 acres, were to be rated at under section 4 of the Rating Act, 1874. This was really a subsidiary question, because the Corporation did not dispute they were liable to pay in respect of the parts used for young timber, whatever this portion of the moorland might ultimately be assessed at. The third question was whether the price paid by the Corporation for the gathering-ground was evidence of the rateable value of the land now in cultivation.

In reply to a question, Mr. BALFOUR BROWNE said that the 1165 acres were bought by agreement at a price amounting to £26 10s. per acre. Other parts were subsequently bought by agreement or under compulsory powers at various prices. In some cases, £76 an acre was paid; in others, as much as £400 per acre. The average cost of the whole area was about £45 per acre. Turning to the questions of law raised on the facts, Counsel admitted that if mere "possession" of land was to be held, for fixing the liability to poor-rate, as equivalent to "occupation," then he was out of Court, and the appeal must fail. He submitted, however, that an owner could be in possession of land and occupy it in this sense that he could maintain an action for trespass and yet have not such beneficial occupation as to entail rating. The Corporation were the freeholders; but they did not occupy the land. They acquired it so as to prevent anyone else occupying it and using it for a purpose which might pollute the water which flowed from it and eventually was collected in the reservoirs.

Lord SHAW: Your contention is this: The Corporation do not beneficially occupy. The only benefit they receive from possession being that arising from non-occupation.

Mr. BALFOUR BROWNE: Exactly—possession not coupled with any beneficial user, and therefore not liable to be rated as the beneficial occupier. The water-works had always been assessed by the respondents on the assumption that the appellants were receiving the water of the gathering-ground in a pure condition, and that any benefit which the appellants might derive from the securing of the purity of the water was therefore already taken into account in fixing the amount of the assessment of the water-works.

Later in his argument, Counsel read the judgment of the Lord Chief Justice, who had said that he thought vacant land was in the same position as an unoccupied house. He then dealt with the position of an unoccupied house, which clearly was not rateable. He submitted that the conclusion that the learned Judge had come to against the

appellants was illogical. An uninhabited house was not rateable to poor-rate, nor was land. The Courts below should have held that the position of the Corporation with regard to this area of moorland was analogous to that of the owner of a vacant house. The mere fencing of the moor was not an act of occupation, but merely of possession.

Lord HALSBURY said that he felt some doubt about this. If there was no occupation of a house, there was no occupation in respect of that house which was taxable at all, because, speaking generally, a house which was not inhabited produced nothing to its owner. On the other hand, one might get a beneficial occupation out of land without occupying it. Land could be used in many ways besides living on it, which would come within the definition of "beneficial occupation" as defined by numerous cases already decided.

Mr. BALFOUR BROWNE suggested that the principle upon which an uninhabited house was not liable to poor-rate applied where land was left uncultivated.

Lord HALSBURY said that the case of an owner of an unoccupied house was specially provided for in the Statute of Elizabeth. By the Statute, certain things were made liable to the poor-rate. A house was one of these things; but if a house was unoccupied, it was exempt from liability to rates.

Lord ATKINSON remarked that this principle of exemption had been held to apply in the case of the owners of a bridge who by Statute were forbidden to take toll.

Mr. BALFOUR BROWNE agreed, and mentioned the case of a recreation ground. He suggested that the real test was what use did the owner put the land to. Did it produce a profit or did it not? If the former, then his occupation was a beneficial occupation; if the latter, it was a vacant possession so far as liability to rating was concerned.

Lord SHAW: You say that the question whether possession includes beneficial occupation is one of mixed law and fact.

Mr. BALFOUR BROWNE: That is my submission.

Learned Counsel having read the other judgments in the Courts below,

Mr. MACMORRAN followed on the same side. He said the owner of property was to be rated in accordance with the use he put it to. If he put it to no use at all, it was not rateable. He submitted that the possession which the Corporation had of the property did not render them liable, because they did not occupy, or intend to occupy, it in any way that would give them a profit.

Lord SHAW inquired if a man chose to shut up a house which was, while occupied, rated to the parish, and so deplete the finances of the parish, could he do so, and avoid liability to rates?

Mr. MACMORRAN said he could, because if the house was empty it was not rateable, and the overseers had no power to say to the owner: The house is empty because you wilfully have for some purpose of your own decided that it shall not be let and occupied, and we rate you on what you could get for the house if you chose to let it.

At the close of his argument,

The LORD CHANCELLOR said they did not at present desire to hear Counsel for the respondents, and would consider their decision.

The House then adjourned.

PERIOD FOR THE RECOVERY OF WATER-RATES.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Tuesday, Nov. 26.

(*Before Justices* RIDLEY *and* SCRUTTON.)

Metropolitan Water Board v. Bunn.

This was an appeal from a decision of his Honour Judge Woodfall, at the Westminster County Court; and it raised a question as to the time within which proceedings must be taken in the Metropolis for the recovery of water-rates in the County Court.

Mr. CLAVELL SALTER, K.C., M.P., and Mr. ROSS-BROWN (instructed by Mr. Walter Moon) appeared for the appellants; Mr. MACMORRAN, K.C., and Mr. GIVEEN (instructed by Mr. E. H. Riches) represented the respondent.

Mr. SALTER, in opening the case, said an action was recently brought by the Metropolitan Water Board against the respondent to recover arrears of water-rate in respect of three houses of which she was the owner in Mayall Road, Brixton. The rates were due down to the quarter ending Sept. 30, 1908; so that a period of more than six months had elapsed after the last rate became due and before the action was brought.

Mr. MACMORRAN remarked that these were rates due from the previous owner of the house. The lady who was respondent in the case only became owner in December, 1909.

Mr. SALTER said the Board wished to have a decision on several points arising on the construction of statutes relating to water supply. The County Court Judge had decided against the Board, on the ground that, in the circumstances of this case, the action in his Court had to be brought within six months of the last rate accruing due. The combined effect of the Water-Works Clauses Act, 1847, the Railways Clauses Consolidation Act, 1845, and Jarvis's Act, 1848, was that, where a water company were suing for rates, if the amount was less than £20 they might go to the Justices within six months, but if it was more than this, they might go to a court of competent jurisdiction at any time within six years. The Board were desirous of having the judgment of the Court on the broad general point arising on these Acts. The action was not, however, brought under the statutes named, but under section 4 of the Water Companies (Regulation of Powers) Act, 1887, which set forth that where the owner and not the occupier is liable, by law or by agreement for payment of the water-rate in respect of any dwelling-house, no water company should cut off the supply for non-payment, but that the water-rate should be a charge on the dwelling-house in priority of all other charges affecting the premises; and, without prejudice to such charge, the amount might be recovered, with the costs incurred, from the owner or from the occupier for the time being, in the same manner as the water-rate might by law be recovered. Under this section, in lieu of the power to cut off the supply, water companies were given largely extended rights. The respondent was sued as successive or subsequent owner; and her liability was not questioned on any other ground but the six months' limitation. She was liable unless she could show that every action brought against a successive owner under the section must be brought within six months. On the face of it, it was a startling proposition; and he submitted that it was not a reasonable construction of the section.

Mr. Justice SCRUTTON: It seems like reading into the section a provision that the charge on the property shall not exist for more than six months.

Mr. SALTER said that was the very point. The practice of the Board had been to bring actions against successive owners in the County Court, because this was the least expensive method of procedure. There were a number of quarters' rent sued for. Six were due under the Act of the Lambeth Water Company, in whose district the premises supplied were situated. The last two quarters' rent were due under the Board's Charges Act of 1907, which now regulated water-rates in the Metropolis. Therefore, the first six quarters' rent arose before these charges were regularized. The general question arose on the first three statutes to which he had called attention; but this was quite apart from the Act under which the action was brought. The County Court Judge had not taken any notes of the case, but had decided the point on it being raised as a preliminary objection to the claim. Counsel referred to the authorities cited in the course of the argument in the Court below, and said they did not appear to afford much assistance on the first point. It seemed that, in construing the effect of the Act of 1847 along with the Water-Works Clauses Act, 1863, and the Lambeth Water Company's Act of 1869, the Court would be driven back upon the words of the statutes themselves. It would be a great pity if the point were decided against the Board, because it would deprive them of all opportunity of being indulgent to customers. On the second point, relating to the last two quarters, Counsel contended that, under their Act, the Board had power to sue in any Court at any time for any amount, however small.

Mr. Justice RIDLEY said they had better hear Mr. Macmorran.

Mr. MACMORRAN said he was going to contend for this general principle—that where a statute gave a summary remedy for the recovery of money, and a subsequent Act gave an alternative civil remedy for the same amount, the period of limitation prescribed by the law with regard to the former remedy applied also to the latter, unless they could find in the subsequent Act something that was inconsistent with it. This was borne out by all the authorities. Dealing with the second point, which arose under section 4 of the Act of 1887, Counsel said the charge on the premises was limited to twelve years, but it was not a personal liability. If the Water Board elected to proceed by the summary remedy, they were bound by the six months' limitation. The section said "without prejudice to such charge the amount may be recovered from the owner or from the occupier for the time being in the said manner as water-rates may by law be recovered." He asked their Lordships to consider the hardship and injustice this might work in a case like the present. The Board might, by their own laxness, allow a bill for water-rates to run up for a long period, and then come down on an innocent subsequent owner. His learned friend put the matter as if the Board were the sufferers; but they were not. They were only claiming something which was never theirs except by virtue of the statutes. The respondent had paid all the water-rates since she became owner, and the others were rates due before that time.

Mr. Justice RIDLEY said they did not think the decision of the County Court Judge could be supported. The action was to recover eight quarters' rent; and the question they had to decide was whether the limitation of six months applied to such a claim as this. He did not know that it was necessary to go in detail through all the Acts to which their attention had been called. The General Act of 1847 and the Acts of 1874 and 1885 contained provisions as to the recovery of water-rates; and these applied to the powers of the Railways Clauses Consolidation Act of 1845 for the recovery of rates. When they looked at this Act, they found that section 140 applied to the recovery of rates before two Justices, the consequence of which was that section 11 of the Summary Jurisdiction Act (11 and 12 Vict., cap. 43) applied; and the proceedings must be taken within six months. This was the way in which the question arose, so far as these statutes were concerned. But in 1863 another Act was passed—the Water-Works Clauses Act—by the 21st section of which it was provided that, if any person refused to pay to the undertaking any rate due, it might be recovered "in any court of competent jurisdiction;" and this remedy would be in addition to the other remedies for the recovery of the rates. There was the Lambeth Water Company's Act of 1869, with similar provision in it; and, finally, there was the Water Companies (Regulation of Powers) Act of 1887, which had been relied upon by Mr. Salter, which was an enactment, as it seemed to him, in regard to the powers of the Water Companies, and a limitation in another direction, because it took away the right to cut off water. It enacted that the water-rate should be charged on the dwelling-house in priority to all other charges; and that the amount might be recovered from the owner or the occupier in the same manner as water-rates might by law be recovered. This was the material part of these enactments, and it seemed to have application to the case before the Court. There were also clauses of a similar character in the Board's Charges Act of 1907. By the 3rd section the final parts of the Water-Works Clauses Act of 1847—among other things, the provisions with respect to the demand and recovery of water-rates—were made applicable, for the purposes of the Act, in so far as they could be, and where they were not inconsistent with the Act and were incorporated; and section 33 was in the same terms as the 21st section of the Act of 1863, which gave general power of recovering rates and costs in any court of competent jurisdiction. The question was whether the limitation of time which was to be found in the section 11 of the Summary Jurisdiction Act had application where proceedings had been taken in a County Court. Mr. Macmorran said that where they found there was to be one remedy in the summary court and another civil remedy was given which was a general remedy, the period of limitation prescribed by the law for the summary remedy applied also to the civil remedy,

unless they could find something in the subsequent Act inconsistent with it. He (his Lordship) found no such principle in the decisions, and he saw no reason for it. If they had in an Act of Parliament two things, one having reference to a court of summary jurisdiction, and giving power to proceed there, and the other with reference to a court of competent jurisdiction, they had to look at the words in the section, and see whether it was right to say—where additional power was given to proceed in the County Court—that it was limited by a statute of limitation which would have application if they proceeded before the Justices. In section 21 of the Act of 1863, there was no reference to proceedings before the Justices; but it said the remedy there given should be in addition to existing remedies. It seemed to him that it was impossible to argue that with such a provision as this the Statute of Limitations, which applied to proceedings before the Justices, should apply to proceedings which were not before them. He doubted also whether it could be said that the Act of 1907 made any difference in the matter. In the result, he thought the learned Judge in the Court below was wrong; and the appeal must therefore be allowed, with costs.

Mr. Justice SCRUTTON concurred, and said he saw nothing in the authorities which compelled him to bring the limitations in question into the Act of 1863. There was no justification for reading into this Act the limitation which primarily applied to the summary remedy given by the Act of 1847. With great respect to the learned Judge below, he was of opinion he had come to a wrong conclusion.

Mr. MACMORRAN said the costs had been arranged. The point which had been argued was a preliminary one, and there were other points to be raised.

Mr. Justice RIDLEY said in that case the action would be sent back to the County Court Judge to hear and determine it with the expression of the opinion of the Divisional Court that the six months' limitation did not apply.

Leave was given to appeal.

CHARGE FOR WATER USED BY BUILDERS.

In a King's Bench Divisional Court last Friday, Justices Channell and Avory gave judgment in an appeal from a decision of the Judge at the Westminster County Court in an action brought by the Metropolitan Water Board to recover the sum of 15s. for water used by Messrs. Johnson and Co. in certain building operations at Hounslow Barracks. The Board claimed under section 17 of their Charges Act; the amount being calculated at the rate of 7s. per cent. of the probable cost of building. The County Court Judge gave judgment for the Board. The circumstances were as follows: In 1911, the defendants, under a contract with the War Office, erected a building at the barracks; and it was a term of the contract that the water necessary for use in the operations should be supplied free of charge to the defendants—the water being used by them from the supply at the barracks, and being measured by the meter in the ordinary course, and paid for by the War Office. Having heard the arguments, their Lordships considered their judgments.

Mr. Justice CHANNELL said in his opinion the appeal ought to be allowed; but as Mr. Justice Avory agreed with the County Court Judge, it would be dismissed. As the question was one of importance, leave to appeal would be granted. He thought the defendants were not persons who required a supply of water within the meaning of section 17 of the Charges Act, and therefore the action was not maintainable. The section referred to persons who desired to become customers of the Board for their water, and merely gave builders a right they did not previously possess where they were commencing to build on land on which there were no buildings. The defendants were using water which was once the property of the Board, and which the defendants were taking from persons who had paid the Board for it. He did not think they were stopped from showing the true facts; and he was not satisfied that anything wrong was being done. If the War Office were breaking their agreement, by allowing the water to be used in the way in which it was done, they might be proceeded against, and possibly were liable to penalties under section 18 of the Water-Works Clauses Act, 1863. This section, however, appeared to provide only for cases where the supply was either for domestic use or for some specified purpose other than domestic. He did not think this case differed from that of a person supplied with water by meter who underlet part of his premises and arranged that the under-tenant should use water coming through his meter. He saw no ground for saying that the Statute, by giving an alternative schedule of charges to builders who required water, intended to give the Board a power to charge them a higher rate than other people. If they wanted to prevent these cases arising in the future, they should put in the schedule to their agreements for water supply the words "non-domestic otherwise than for building operations," or some equivalent words. Then by proper proceedings they might be able to get the charge they claimed.

Mr. Justice AVORY held that the appeal ought to be dismissed. He thought that the meaning and effect of section 17 was that a builder who needed a supply of water for his building operations must make a request for it to the Board, and pay the special charge for it. The builder could not be held to say that he did not require the water, because he had succeeded in obtaining it without making the proper request under section 16.

The appeal was dismissed, with costs; but leave to appeal further was granted.

CLAIM AGAINST THE WANDSWORTH GAS COMPANY.

Jury Cannot Agree.

At the Wandsworth County Court last Wednesday, before his Honour Judge HARINGTON and a Jury, the hearing was concluded of an action for damages brought against the Wandsworth and Putney Gas Company by Mr. and Mrs. James Roots, of Malva Road, Wandsworth, in respect of illness caused through the alleged negligence of the Company's servants in allowing gas to escape from a disused pipe in premises rented by the plaintiffs. The proceedings at the previous hearing were reported in the "JOURNAL" for the 12th ult. (p. 525).

Mr. MARTIN O'CONNOR appeared for the plaintiffs; and Mr. CROMPTON SMITH represented the Company.

Dr. *Davis* was the first witness. He deposed that, in conjunction with Dr. M'Murtry, he examined Mr. Roots on the 28th of October. He had a septic throat, and great difficulty in breathing. This was not a symptom of coal-gas poisoning; and he considered it due to infectious disease, like influenza. It was impossible to get gas poisoning without smelling gas; and Roots said he did not smell any.

Dr. *Mark Robinson* said that a chronic case of gas poisoning would not be established between the 25th of April and the 3rd of May. In such a case, all the red corpuscles of the blood would be affected, and the person would look pale and emaciated. Mr. Roots was not in this condition. He had examined Mrs. Roots, and came to the conclusion that she was suffering from influenza; and this confirmed him in the opinion that he had formed as to what was the matter with her husband.

In answer to Mr. O'CONNOR, witness said if it had been a case of gas poisoning he should have expected that both the man and his wife would have been affected together, as they occupied the same bedroom.

Mr. O'CONNOR said the meter was a prepayment one, and that the gas only escaped when the wife rose to get breakfast, and dropped the penny in the slot. He put it to witness that while the wife was in the kitchen the escaping gas would reach the room where the husband was, and he might suffer while the other occupant of the room would not. If the man had headache, was nearly pulseless, and suffered from nausea and giddiness, what would they be symptoms of other than gas poisoning?

Witness said any stomach derangement would cause them.

Oliver William Dougan said the gas was first supplied at the house in 1909. Witness saw the fittings put in. They were new pipes and were very good. In December, 1910, the gas was disconnected, and there was none in the house until July, 1911. When a report of an escape of gas reached the Company, a man was sent at once. He went to the house and inspected the interior of the room. Later he had a conversation with Mrs. Fraser, who formerly lived in the house; and she said she had not smelt gas during the time she was there.

In cross-examination, witness said he did not see that there was any reason for the pipes in a house to be inspected when a change of tenant took place.

By Mr. SMITH: He had been 27 years in the Company's service, and had never known of a case of gas poisoning through an escape from compo. pipes.

Henry Burchell spoke to going to the house in December, 1910. To the best of his belief, the compo. piping was cut in the window recess in the room, and outside the room near the meter. He denied that he cut the pipe inside the room.

Frederick Walter Benton deposed that when the report of the escape of gas was received he went to the house, and found Mr. Roots in bed. Mrs. Roots showed him the pipe. He smelt all the pipes, but could not find any escape of gas. He denied that he told Mr. Roots that it was lucky he had not been killed. The end of the pipe looked as though it had been broken off, and not been done up in a workmanlike way. But there was no escape of gas while he was there.

His HONOUR said there was no case to go to the Jury with regard to Mrs. Roots.

The Jury retired to consider the claim of Mr. Roots; but after a lengthy absence they returned and informed the Judge that they could not agree.

His HONOUR said they would have to be discharged, at which he expressed regret.

Claim in Respect of a High-Pressure Lamp Installation.

Before his Honour Deputy Judge Lloyd, at the Edmonton County Court, last Thursday, the Enfield Gas Company sought to recover from Mr. T. E. Williams, late of Church Street, Enfield, damages arising from a breach of agreement in respect of the high-pressure lamp installation on the above premises. Mr. Windsor, who appeared for the plaintiffs, stated that in May, 1911, the defendant signed an agreement undertaking to hire from the Company, for a period of three years, two high-pressure lamps, with the necessary appurtenances, and to be supplied with gas to the lamps at an inclusive yearly rental. In May of the present year, however, Mr. Williams gave up the tenancy of the premises, and the Company were obliged to remove the installation; and they now asked to be reimbursed in the sum of £7 5s. 4d., being the cost of installing and removing the lamps and fittings, and the estimated loss of profit which would have been received during the remaining term of the agreement. His Honour gave judgment for the Company in the sum named, together with the cost incurred by the action.

Claim against a Gas Company.—At the Haywards Heath County Court last Thursday, Noah King sued the Cuckfield Gas Company for £2, the balance of an account for work done in connection with the laying of some mains. The Company argued that under the contract plaintiff was liable for the re-instatement of the road. The Company had no certificate from their Engineer (Mr. D. T. Livesey); and the Council instructed their Surveyor to carry out the work of re-instatement and charge the cost to the Gas Company. Mr. Livesey said that in his opinion the work done by the Council exceeded in amount that for which plaintiff was responsible; and the Council's Surveyor expressed the opinion that the work of laying the mains was properly done, and the wear and tear on the road caused the subsequent depressions which called for further attention. Judgment was given for the plaintiff for the amount claimed.

The Directors of the Power Gas Corporation have declared a dividend of 4 per cent., less income-tax, on the ordinary shares; being the same rate as at this time last year.

MISCELLANEOUS NEWS.

THE GAS EXHIBITION IN EDINBURGH.

A Successful Undertaking.

The great success which attended the recent gas exhibition promoted by the Edinburgh and Leith Gas Commissioners is evidenced by the following report submitted to the Commissioners by Mr. Alexander Masterton, the Gas Engineer and Manager.

I beg to report that the gas exhibition was brought to a successful termination on Saturday, Nov. 2, amid great enthusiasm on the part of the public, who patronized it in large numbers—the total attendances for the ten days being estimated at about 65,000 persons; and the drawings, including cheap tickets which were issued to stallholders and plumbers in the town, amounted to £1108 12s. 9d.

I have prepared a balance-sheet (subject to revision pending adjustment of accounts) showing all the items of expenditure and revenue; and it is gratifying to be able to state that, though the expenses were very heavy, totalling £2458 12s. 4d., there is a balance of £93 3s. 3d. on the right side. In addition to this, the amount of business done has been considerable; over 1000 orders for fires being received, and inquiries for various other appliances coming to over 500. These are all being carefully followed up, and additional temporary inspectors have been put on to cope with the increased work.

The plumbers and ironmongers have received a moderate share of business of connecting fires through selection by consumers; but the greater number of the public have desired the Commissioners to do the necessary fixing. However, in order that the "trade" may receive encouragement to support the Commissioners in their efforts to promote the use of gas, I suggest that a number of the orders should be handed over to the plumbers in the various districts, as our staff is unable to cope with the work within the time required. This will be quite understood when it is mentioned that practically all the fires will have to be connected during the next few weeks.

It is satisfactory to note that, though there was a vast amount of work to be overtaken in connection with the fitting-up and preparation of the Market, as also in the clearing out of the exhibition piping, fittings, &c., from the building, everything was completed well within the time allotted. I have also to state that there was a strong feeling that the compressors, engines, and high-pressure lighting plant fixed up both inside and outside of the Market might be left there for some time, to enable an extended test to be made of the lighting efficiency, cost, and maintenance; and I was hopeful the negotiations for its retention might be successful. Unfortunately, I learn that all the arrangements have been made by the management relating to the lighting for the Christmas Carnival, and likewise that the space presently occupied by the engines and compressors has already been let. Under these circumstances, therefore, we are reluctantly compelled to remove the installation.

Incidentally, I may mention that the Town Clerk has asked for estimates for high-pressure gas in connection with the proposed scheme for lighting the Calton Hill; and this is presently receiving my careful attention.

In conclusion, let me say that all the firms are well satisfied with the business done at the exhibition; and the interest aroused should result in great benefit to the gas undertaking. Although we have been burdened with an enormous amount of orders, everything possible is being done to execute them in reasonable time.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. H. D. Ellis in the chair.

The Secretary (Mr. H. J. Luff) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

Coal and Coal-Waggons.

The Chairman, in moving the adoption of the report and accounts, said he would run through the accounts, and interject a few observations from time to time as necessity arose. Beginning with the revenue account, it would be seen that the item of coal, purification, and wages cost more than in the preceding year. This, of course, would occasion no surprise. The question of coal in India had been a serious one, as it had been in England, during the past year. The difficulty arose from the strike here at home; and when the chief output of the world was stopped, it invariably followed that the coal markets of the whole universe were dislocated, and extra pressure fell upon the other outputs of the world. So it was in India. The price of coal went up appreciably. But that was not the worst of it, because, in addition to the enhancement of the price of coal, there was trouble through the shortage of waggons, so that at one period it was difficult to get coal at any price. The position became so acute that important and influential meetings of merchants and manufacturers in Calcutta were held, and firms similarly situated in London had meetings; and he believed deputations were sent to the Indian Government on the question, because, as the shareholders were aware, the Indian railways were much more dependent upon the Government in regard to the purchase of waggons than were the English railways. Very strong pressure was brought to bear upon the Indian Government; and he hoped this would have good effect. He was happy to say the Company suffered less than most of their neighbours. The Company had fortunately some advantageous contracts; and, moreover, their General Manager, with prudent foresight, before the pinch became most acute, got in as much stock as he could. The Company's favourable contracts would run through and beyond the current financial year; so that, if there was no recrudescence of the waggon difficulty, he thought they need have no anxiety with regard to coal during the current financial year.

Official Changes.

The next item exhibited a reduction of salaries in India and London. This arose chiefly from the fact that one or two officers of long standing, and consequently drawing maximum rates of pay, had passed from their service, and new officers had come in at commencing rates. He must explain this, otherwise the shareholders might think the Directors had not been acting up to the policy of having a strong English staff out in India. The Directors still thought it was most important to have a strong English staff; and accordingly, since the last meeting of shareholders, they had added to it. The first opportunity was on the occasion of their old Chief Cashier and Accountant—an Indian gentleman of advancing years—relinquishing his post. The Board thought that was a favourable opportunity to consider the reorganization of this important department; and they had no difficulty in coming to the conclusion that it was desirable to appoint an English Chief Cashier and Accountant. They were able to engage in Calcutta an English accountant who had been there some years—an accountant of experience, one acquainted with the country, the people, the language, the customs, and the currency, and a man with a knowledge of the commercial business of the East. Moreover, he was salted to the climate. So that this was much better than sending out from England what he might call a "green hand," who, whatever his professional attainments might be as an accountant, would necessarily have a good deal to learn out there, and take some time to become acclimatized. The new Accountant (Mr. Waymark) entered upon his work with energy and zest, and soon got a thorough grasp of the position; and he had made to the Board various recommendations of reform. The Board thought fit to consult their local Auditors upon these recommendations. He (the Chairman) had no doubt the shareholders would remember the Company had an English firm of accountants of good standing in Calcutta who were their local Auditors, and every bill passed through their hands. These local Auditors replaced their antiquated Local Committee, who used to exercise some sort of supervision over the accounts. He was happy to say the local Auditors approved of Mr. Waymark's recommendations; and they had been taken in hand, and he had no doubt they would be beneficial to the Company. They had also sent out to Calcutta recently another gentleman to assist Mr. Snelgrove, their General Manager; but his work did not come within the scope of the financial period under review. He had yet to win his spurs; and he (the Chairman) hoped their new Assistant would prove a valuable officer.

A Sound Policy.

The items of mains, meters, services and fittings, and wear and tear of works, grouped together, showed a reduction of between £1900 and £2000 upon the corresponding figures of the preceding year. It must not be supposed that this reduction indicated any false economy, such as starvation of the works, or anything of that sort. The works had been fully maintained; and every rupee that was necessary had been expended upon them. They are in excellent condition at this moment. Not only so, but the two items he had named included an appreciable proportion of the new work of the present twelve months which was referred to briefly in one of the paragraphs of the report. The Board had always thought it good policy to charge revenue with as much of this sort of liability as fairly could be done to save the capital account. The result was that, at this moment, the capital was, in round figures, equal to only about £780 per million cubic feet of gas sold. This was a figure which was exceeded, and in some cases largely exceeded, by some prosperous English companies, who had a far larger average number of consumers per mile of main than they had in Calcutta.

Purifying the Arrears Account.

As to the item of bad debts and allowances, they would see there was an increase; and he must now go back to Mr. Waymark. Among other matters that he had examined critically was the arrears account, and he thought there were several items which it was not healthy to carry forward any longer as due to the Company; and he advised that they should be written off. It would be seen that there was an amount of £750 that had been written off; and he (the Chairman) was sure the shareholders would agree that this was a prudent thing to do. Writing off like this purified the arrears account, as they were no longer carrying forward amounts that were doubtful. Still they might get part of it in. The item of general expenses he need not go into. He told the shareholders last year they would be lighter this year; and so they were. The result was the expenditure on the year was £77,794, which was almost the same as it was in the preceding year.

The Effects of Higher Efficiency Appliances.

Now he would turn to the credit side of the account. The gas-rental, residual products, &c., showed a reduction owing to a less quantity of gas being required for the public lighting than under the old system. This did not take the Board, nor probably any of the shareholders, by surprise. He should, however, like to observe this: The lighting of Calcutta was on an improved system. Decreases in the volume of gas consumed always followed as a matter of course the progress of economic means of consumption. It was so when the incandescent mantle was introduced. It effected enormous savings in the quantity of gas consumed, and was regarded by many people as a formidable danger to gas companies. But the actual sequel was that this reduction in the quantity of gas required to produce a given efficiency of light was a most potent factor in extending the popularity of the economical illuminant, and in multiplying, to a remarkable degree, not only the number of those who used it, but also the rate of consumption of the existing consumers. He hoped this might be so in regard to Calcutta. He considered they were warranted in looking forward to an increase in the number of lamps. Their General Manager, in his annual report, informed them that he had in hand orders from the Corporation for the erection of a further 1200 gas-lamps for the lighting of new streets or the displacement of oil-lamps. Perhaps, however, the most agreeable prospect was that afforded by private lighting. This had increased about 7½ per cent. upon the previous year. But a better indication still, he thought, was the meter-rents. These had very

largely increased; and this was a significant item to those familiar with gas management. Their General Manager also reported that the use of gas for industrial purposes was growing rapidly. The public now realized that the Company could supply a good day-pressure. To illustrate what this might mean to the Company, he need only mention that the daylight send-out of many English gas companies was equal at times to that of the night. The consequence was that the saving in the cost of storage was very great. They had also gained well over 400 consumers in the year; and the requirements of the consumers, other than for lighting, included stoves, geysers, coffee-roasters, heaters, ring-burners, cooking-ranges, engines, and laboratory apparatus —a novelty for their Company. Another interesting item he might tell them was that the Company had been asked by an important undertaking in Calcutta to fit up for them an installation for a purpose to which gas had never been applied so far as he (the Chairman) was aware. This might be a success. If so, there were pleasant possibilities in future arising from it.

ECONOMIES IN CARBONIZATION.

In addition to the prospective extensions of business to which they looked, there were the economies in carbonization. He told the shareholders a year ago that probably at the time he was speaking the first of the new regenerative furnaces at their works was being lighted up. Since then the entire retort-house equipped with regenerative furnaces had been completed, and was in full action. The make of gas per ton of coal had very greatly increased. With this gain on the one hand, and the saving in the cost of carbonization on the other, they ought surely to reap considerable benefit by way of a set-off to the reduced consumption per lamp on the public lighting.

RESIDUAL PRODUCTS.

In regard to the residual products, the trading in them had been very favourable. They had made from them a profit of £1653 above what they did in the preceding year. This was owing to the improved sales of coke; and this was due, in a measure, to their Manager having promoted the establishment of depôts in various parts of the city and suburbs for the sale of coke—that was to say, he had brought the coke close to the consumer; and when commodities were brought to people's doors, they would take them more freely.

BALANCE OF PROFIT.

The upshot was a balance on revenue account of £24,064, which was carried to the credit of profit and loss account; and, added to the balance brought forward, they had a total of £33,935. On the other side was the interim dividend paid last May; and they had also paid income-tax. They had, unfortunately, suffered a loss on the sale of investments, which was a familiar item to everybody now. Further, the Board had thought fit to apply £500 to writing-down the value of investments. With interest on loan at the bankers (which was less by £1600 than at this time last year), a balance of £19,500 was left, out of which to declare the dividend they recommended, and which was at the old rate. The payment of this would leave a good balance to carry forward to the new year. He thought the shareholders would agree with him that this was a satisfactory condition of affairs. It was true the balance carried forward was rather reduced from what it was, but he saw no harm in reducing the balance so far. Now they had left a balance of about £6000 to bring into the current year. They could have inflated it if they had chosen to encroach upon their Reserve Fund, which was composed of invested balances.

NEW EXTENSIONS.

Regarding the works' operations of the year. They had laid down over 24 miles of main, of which approximately 10 miles was relaying work, leaving a net extension of 14 miles. They had also completed the new retort-house, stoking machinery, coal-handling plant, new buildings (in addition to the retort-house) including a power-house and a tar tank, pressure-recorders, exhausters, pump, and a light railway, and another condenser. From this it would be seen that their operations had been manifold and varied. These extensions and improvements represented a considerable amount, of which they took £15,000 out of the reserve fund, and the balance was charged against the revenue account.

LIGHTING OF HOWRAH.

The shareholders might have seen in the newspapers that, in the annual report of the Howrah Municipality it was stated that the Company's contract, which expired next autumn, would not be renewed. With regard to this matter, tenders were invited from the Gas and the Electric Companies some eight or nine months ago. Then modifications of the specifications were put forward, and modified tenders in accordance therewith were invited. If his memory was not at fault, this process was renewed more than once, until it almost looked like a competition at auction between the parties tendering. The Gas Company's final tender was almost a bed-rock figure, and was the lowest tender submitted. Notwithstanding, the higher tender of the Electric Light Company was accepted. The Board would have preferred to have obtained the contract, if only as a matter of sentiment; but he doubted whether they had lost very much, for the profits would have been extremely moderate. Meanwhile, they were employing all their Howrah strength to push to the utmost the business of private lighting. He understood the Corporation were projecting improvements in Howrah. They talked of multiplying the number of public lamps by something like 250 per cent. Well, the Gas Company would not grudge the new contractors that. They would rejoice in it, as all that is calculated to attract an increased residential and commercial population tends to enlarge the field of their own labours; and they looked forward to enjoying the fruits of this development in the form of increased private consumption. They were even now beginning to see indications of this; for their General Manager reported that already they had gained some consumers whose requirements might be considerable.

OTHER PUBLIC LIGHTING MATTERS.

The Board had concluded a contract for the lighting of the Maidan—lighting on an improved scale; and this had been in operation now for some time. He was happy to say the authorities were well satisfied with all the Company had done and were doing, and not a single complaint had been received. The Company were now negotiating with another important public body for a contract to supply them. But as negotiations were proceeding, he would say nothing more with regard to it. Then there was one other matter which had also been in the newspapers. He did not know that he need say anything about it, except that his silence might lead the shareholders to think there was something more serious in it than there really was. Therefore he would tell them what the position was with regard to the arbitration with the Corporation of Calcutta. The matter was, of course, *sub judice;* and he could not open his mouth very wide. But he might tell the shareholders this. Points of practical difficulty were inevitably experienced when effecting a change of lighting from the old system to the new. And perhaps, their new duties presented to the Corporation officials the hard features of novelty without any of their proverbial charm. Theoretically at the first stroke of midnight on Feb. 29, the change was to spring into being, as by the stroke of a magician's wand. But an intermediate period during which the change was being made necessarily ensued. Then some questions in regard to both pressure and leakage arose, the rights and liabilities in relation to which were not ascertainable under the clauses of the agreement. This being so, the Board thought the most equitable and satisfactory course would be for the questions to be settled by arbitration as laid down in the agreement. The Board communicated their views to the Corporation; and he believed the Corporation did not regard them as an unwelcome solution of the difficulty. This was as far as he could carry the statement of the circumstances. The arbitration would proceed; and he hoped would be settled amicably, and without any ill-feeling. Certainly there would be none on the side of the Company. The Board desired to maintain the most harmonious relations with the Corporation. For better or for worse, the Corporation and the Company were bound together in a 20-years' *quasi*-partnership for effecting the public lighting of Calcutta, As surely as friction between the parts of an engine impaired the effective value of the whole, so dissension between partners must militate to the disadvantage of the enterprise in which they were embarked. The Company would do all in their power to prevent any dissension or friction arising; and he looked forward with confidence and hope to the Corporation, under the sagacious leadership of their able Chairman, giving them their co-operation to make this twenty years a period of mutual goodwill and mutual respect. Then they would be able to unite their combined forces to the promotion of the interests of Calcutta and of its citizens.

EXCHANGE.

The only other point was the matter of exchange. The rate of exchange had been uniformly favourable. It had been so favourable that the shareholders would see a profit of £160 had been made on their remittances. The shareholders might have seen something in the public press regarding the Indian gold reserve. They knew that, on the recommendations of a Committee which sat some fourteen years ago, called the Fowler Committee (its President being Sir Henry Fowler, afterwards Lord Wolverhampton), it was resolved that India should have a gold standard, while retaining a silver currency. India had no gold currency. The mints were to be closed against the coinage of silver, except for the Government, who were to have the monopoly in the coinage of silver; and it was settled that the profits on that coinage should be invested as a gold reserve for the purpose of maintaining the ratio of exchange—15 rupees to the pound sterling. The profits on the coinage were very large—the intrinsic value of the rupee being about half its current value. It followed that the greater the discrepancy in that value, the greater was the necessity for the gold reserve. But the gold reserve had been dealt with at various times, and had been depleted. He could not tell the shareholders all that had happened. He brought this matter to their notice now because it affected them very closely, inasmuch as, if the gold standard was depleted much further, a point might be reached when it must inevitably follow that the rate of exchange would fall, and, instead of making a profit on the remittances, they must make a loss, for the rate of exchange would fall far below the 16d. at which it had stood. It behoved all who were interested in Indian undertakings, and had to remit their profits to this country, to impress upon their representatives in Parliament the absolute necessity of insisting that the gold reserve should be maintained intact. Then the ratio of 15 to 1 would be well maintained; and they would suffer no loss.

Mr. ROBERT MILLER seconded the motion.

The CHAIRMAN, replying to comments by Mr. T. W. Forman, stated that the Directors' fees were increased by the shareholders last year by £400, making the sum £1600. As to the point that the £500 charged as depreciation on the investments was heavy, he (the Chairman) thought it was a matter of prudence writing-down the value upon their books. Regarding the price for the public lighting, the new contract was on a different scale altogether. Under the old contract, the Company provided not only the gas, but the lamps, the mantles, lighting, extinguishing, maintenance, and everything else. Under the new contract, the Company provided the gas; the Corporation all the accessories. That was why he had spoken of a *quasi*-partnership between the Corporation and the Company. Mr. Forman had expressed his sorrow that there had been so many changes in the Calcutta staff, and added that this did not say very much as to the way things were conducted, and had remarked that two officers had left this year. The Chairman observed that this was a matter he could not discuss. The appointment, the remuneration, and the discharge (if he might put it that way) of the officers was entirely a matter for the Board, and only for the Board. They were responsible for that. It was so provided by the Articles of Association. The Directors acted as they thought was best in the interests of the shareholders, of whom the members of the Board were part.

Mr. LOUIS PENNY remarked, as to the Directors' fees, that he hoped there was no shareholder who supposed the Directors voted an increase to themselves. The resolution to increase the fees was proposed by a shareholder, and carried, at a meeting at which he (Mr. Penny) was present. He congratulated the Board upon all they had done in the interests of the shareholders.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. T.

EASTMAN, a dividend of 8 per cent., less the interim dividend of 3½ per cent. (free of income-tax), was declared.

Moved by the CHAIRMAN, and seconded by Mr. W. WILLIAMS, Mr. Eastman was re-elected a Director.

The Auditors (Messrs. S. W. Savage and F. Seel) were also re-appointed. The last-named gentleman took the opportunity of remarking that the dividend of 8 per cent. practically represented 8½ per cent. at the present rate of income-tax, as it was paid free of income-tax.

The CHAIRMAN, in eulogistic terms, proposed a vote of thanks to the General Manager and the staff in India, as also to Mr. Luff and the London staff.

Mr. STANLEY H. JONES seconded the motion, which was cordially passed.

Mr. LUFF having responded on behalf of himself and his colleagues,

Mr. PENNY proposed a vote of thanks to the Chairman and Directors.

Mr. W. C. ELLISON seconded the motion.

Mr. JAMES C. WATSON, in supporting the motion, remarked that he noticed the Chairman commented on the policy of putting matters into first-class order in Calcutta. He thought the money expended by the Board would be of great service in placing the Company in a very good position. For this he thought the shareholders might thank the Board, because he believed that they would see the money back again. At any rate, he hoped this would be so, and that at some time in the near future they would have, as a result, an increase in the dividend.

The motion was heartily carried.

The CHAIRMAN having responded, the proceedings terminated.

TORONTO CONSUMERS' GAS COMPANY.

A Progressive Canadian Undertaking.

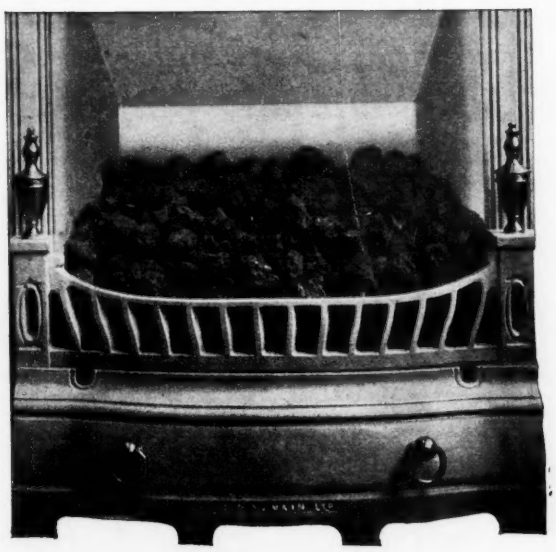
The report of the Toronto Gas Company for the year ended the 30th of September, which was presented and adopted at the recent annual general meeting, opened with the satisfactory statement that the output of gas in the period named was 3,119,748,000 cubic feet, or 276,707,000 cubic feet more than in the preceding year. Rather more than 28 miles of new mains were put down and 6394 services laid. In order to meet the extraordinary increase in the demand for gas, the Directors found it necessary to make further extensions at the works; and contracts have been entered into for the erection of new buildings and plant which will increase the Company's manufacturing capacity by 4 million cubic feet per day. The twelve months covered were the first complete year during which gas was sold at the reduced price; and the Directors stated that the concession of 5c. per 1000 cubic feet amounted, on the output of gas for the year, to about $150,000.

The accounts accompanying the report showed that the income was $2,464,368, of which $2,058,140 represented the revenue from the sale of gas. The expenditure came to $1,746,234; so that there was a balance of $718,134. There was an increase of 9478 in the number of meters in use at the close of the financial year, compared with the corresponding period of 1911; and the revenue from gas was $201,069 higher. The Directors considered the result of the year's operations particularly gratifying, when the fact was borne in mind that it had been necessary for the Company, in common with other large employers of labour, to meet demands for increases in workmen's wages, and that there had been an advance in the cost of materials used in connection with the manufacture and distribution of gas.

In the course of the proceedings at the meeting, the President (Mr. A. W. Austin) remarked that the shareholders had been accustomed to getting good reports; but he thought the one which had been submitted that day was the best they had had; and he was sure they were all glad to find that as the Company grew older it became stronger and healthier. No organization could attain its highest success without harmony and confidence between the management and the employees; and he wished to say that he was unaware of any institution where harmony, zeal, fidelity, and keen devotion to the interests of the concern existed in a greater measure than in the services of the Company. As the President, it was a source of great satisfaction to him to say this; and he always believed in giving praise to "the men behind the gun." He felt that they might justly felicitate each other upon the completion of useful endeavour, and reasonably expect to continue for a long time to deserve, and hence to receive, an increasingly large share of public favour.

The General Manager (Mr. Arthur Hewitt), in compliance with a request, made a few remarks. He said the shareholders, assured of their dividend in any event, had more than a selfish interest in the affairs of the Company. Their interest was a public one; and the responsibility of the Directors and the management was not confined simply to the proper protection of the shareholders' property, though this was a matter of the utmost importance, but extended to the needs of the smallest consumer of the Company's product. It was indeed an enviable position which afforded an opportunity to serve a large community with a commodity at once a necessity and a luxury—a necessity in respect to being a convenient and economical method of lighting and cooking, and a luxury in that it was possible, even for people of limited means, to secure many comforts in their household which would be impossible without an abundant supply of gas at a low price. Nor was the low price of gas the only advantage which the Company afforded to the citizens of Toronto. It had been realized by the Directors and the management that the demand of the public upon the Company was for a thoroughly dependable and complete service. He thought this demand had been fully met. He referred to the fact that the Company's output of gas had more than doubled in six years, and that in 1912 they had nearly twice the number of consumers they had in 1906. In the latter year, 16 miles of mains were laid; whereas in the year just closed, as stated in the report, 28½ miles had been put down. Notwithstanding the rapid and large increase in the number of consumers, and in the volume of the output, he believed that at no time in the history of the Company had so few complaints been received from their patrons as at the present time. He considered that

More Appreciation.



The following is an extract from a letter received from a customer, who has had a "St. Nicholas" Fire:—

"Just a note to thank you very much indeed for the beautiful stove fixed at my house in Purley—IT IS AN ORNAMENT TO THE ROOM."

THE "ST. NICHOLAS"

is admired and appreciated wherever it is seen. It is a potent factor in popularizing gas for heating in every district where it is introduced.

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SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

the adoption of the system of rendering accounts monthly instead of quarterly had had the effect of making disputes and difficulties between the Company and their customers almost non-existent. In conclusion, he referred to the remarkable fact that while the cost of practically every other known manufactured commodity had increased during recent years, the price of gas had been consistently reduced. He also stated that while the total receipts from the sale of gas during the year had been a little more than $2,000,000 dollars, the amount paid to the Company's own citizen employees in wages had been nearly $800,000.

PROPOSED NEW GAS-WORKS FOR CLECKHEATON.

Local Government Board Inquiry.

At the Cleckheaton Town Hall, on the 22nd ult., Mr. P. M. Crosthwaite, M.Inst.C.E., held an inquiry respecting an application made to the Local Government Board by the Cleckheaton Urban District Council for sanction to the raising of additional capital for the purposes of their gas undertaking. Among those present were Mr. B. Hirst and Mr. J. Fenton, the Chairman and Vice-Chairman of the Gas Committee; Mr. A. L. Jennings, the Gas Engineer and Manager; Mr. G. H. Niven, the Consulting Engineer and former Gas Manager; Mr. William Newbigging, of Messrs. Thomas Newbigging and Son, Manchester, specially retained by the Council as Consulting Engineer in connection with the inquiry; and Mr. F. D. Richmond, the Engineer of the Heckmondwike and Liversedge Gas Company.

The Clerk (Mr. J. H. Linfield) gave the usual statistical particulars in regard to the rateable value of the district and the outstanding loans; the amount owing for the gas-works being £15,241. He said the inquiry embraced two applications for gas-works purposes: (1) For sanction to the borrowing of the residue of capital authorized to be expended under a Provisional Order granted in 1888; and (2) to secure an amendment of the Cleckheaton Local Board Act, 1870, that the present authorized capital of the undertaking might be extended. The sum involved in the first application was £21,400, and in the second £50,000. Having given a history of the gas undertaking, Mr. Linfield said that since its acquisition in 1869 the consumption of gas had steadily increased. Between 1888 and 1908, it had more than doubled; having reached 110 million cubic feet. The following year, owing to a diminution in the quantity of gas used for trade purposes, there was a very small reduction. But in 1909-10 it rose to 111,790,000 cubic feet; for the year 1910-11 it was 117,758,800 cubic feet; and for the last financial year 122,532,000 cubic feet, This satisfactory growth of consumption was being still maintained. This made it increasingly difficult for the Council to meet the demand from the present works; and during the last three or four winters these works, which were old when they were acquired, had been employed to their full capacity. The Council had been compelled, at considerable cost, to arrange for a direct-fired retort-setting to be put in with the object of augmenting the supply; and by this arrangement it was hoped to meet the requirements of the district during the winter months of this and next year. But if it should prove inadequate, further temporary arrangements would have to be made. The question of erecting new works had been periodically revived, and had been under consideration for many years; and it had been generally recognized that they must be put up sooner or later. The Council were advised that the time had now arrived for undertaking the work. The scheme of the Council in its entirety was estimated to cost £57,150. It was their intention to proceed at once with the installation of carbonizing and purifying plant, the provision of a railway siding, and the imperatively necessary parts of the scheme. The erection of a large gasholder would most likely be deferred for a few years; so that the full amount of the proposed borrowing powers would not be immediately utilized. The expenditure during the next few years would probably amount to about £40,000. Having given some figures to show the substantial benefits to the town which had resulted from the possession of the gas undertaking, Mr. Linfield said the Gas Committee had not hurriedly arrived at the decision to proceed with the erection of new works, but had given the matter most careful consideration; and the Council felt that the scheme and the manner in which it was intended to proceed with it were conceived in the best interests of the district.

After a few questions put by the Inspector as to the present storage and purifying capacity of the works,

Mr. *Newbigging* was called in support of the application. He said the site of the existing works was too small to permit of economical dealing with the present output of gas; and it was out of the question to think of extending them. The whole question, indeed, turned on this point—that it was impossible to extend the present carbonizing plant on account of the limitations of the site. This only left one course open; and in his opinion no time should be lost in proceeding with the new scheme. As a matter of fact, the Council ought to have moved in the matter a year or two sooner; and any undue delay now would undoubtedly jeopardize the supply of gas. The site selected was a very good one, and had the special advantage that it was near the railway, and that the reception of raw materials and the dispatch of residuals, &c., would be much facilitated. The producing capacity of the present works was 550,000 cubic feet daily; but the maximum output had occasionally been as large as 650,000 cubic feet. The intention with regard to the new works was to provide for a daily output of 750,000 cubic feet in such a way that it would be readily and economically practicable to increase it as necessity arose. With such a capacity, the margin would not be great; but it was not desirable to burden the Council too heavily with capital debt until it was actually required. Negotiations had already taken place with the Railway Company with the view to the provision of a siding.

The plans of the intended new works were then placed before the Inspector, and jointly explained to him in detail by Mr. Newbigging and Mr. Jennings.

There was no opposition to the application.

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DO YOU REALISE the supreme importance of fixing only such fires as are ABSOLUTELY HEALTHFUL—fires which can be used, without vapourising pans, and which do not cause an oppressive, headache-producing atmosphere?

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FELIXSTOWE ELECTRICITY UNDERTAKING.

More Money Required by the District Council.

At the Town Hall, Felixstowe, last Tuesday, Mr. H. R. HOOPER, M.Inst.C.E., held an inquiry with reference to an application from the Urban District Council for sanction to borrow £4052 for the electricity undertaking. An additional application was made during the inquiry for a further £1000 for street lighting purposes.

The usual details of the population and other statistics having been furnished,

The CLERK (Mr. Montagu Humphrey) asked for an extension of £1000 to the loan for the purposes of street lighting.

The INSPECTOR said the application was quite in order, and would only have to be confirmed by resolution of the Council. He would, however, like to know the reason for this. How much money would be saved by the new contract for street lighting?

The CLERK explained that the contract of the Gas Company for street lighting would expire at the end of the year. The Company and the Electrical Supply Company were invited to give tenders for street lighting [see *ante*, p. 532]. The latter Company then gave notice that they would insist on the Council carrying out the sealed agreement dated June 4, 1903, under which the Council agreed not to use any artificial illuminant for lighting the Promenade, or any road or part of a road, other than electric light, and would take the current for such light from the contractors exclusively. Up to this year, the agreement had not been insisted upon by the Supply Company; but seeing that the Council were asking to have new tenders for street lighting, they said they would insist on the agreement being carried out.

In reply to the INSPECTOR, the Clerk stated that the price to be paid to the Company for street lighting would be 3½d. per unit.

The INSPECTOR: Not many towns pay that.

The CLERK: We are in negotiation for more advantageous terms.

The INSPECTOR: This seems to be a very high price. The conditions in 1903 were not the same as they are in 1912. Circumstances alter cases.

The CLERK repeated that the Council were in negotiation with the Supply Company, who had taken no action up to the present time.

The INSPECTOR suggested that this application should be left out for the present.

The details of the application were then explained to the Inspector, and, after discussion, they were altered as follows: Battery extension buildings, £500; battery extension, £1200; mains, services, switch gear, &c., £1730; and meters, £500—in all, £3930. It was stated that the work would be carried out by contract.

At the close of the inquiry, complaint was made by Mr. Alexander, a ratepayer and property owner, that the town was being spoilt by overhead wires; and he asked whether, in future, cables could not be laid underground. The Inspector said this was a matter which rested with the District Council, not with him. Mr. Alexander also complained of the noise caused by the Diesel engine, which was understood to be a silent one. The Inspector said the Council would have to be addressed on this matter; whereupon Mr. Alexander said he "might as well talk to the wind."

ASSOCIATION OF COAL-TAR DISTILLERS.

A joint meeting of members of the Chemical Trade Section of the London Chamber of Commerce and the Association of Coal-Tar Distillers took place at the offices of the Chamber on Nov. 12, when Mr. J. C. Umney, the Chairman of the Chemical Trade Section, was voted to the chair. The report of the proceedings, as appearing in the "Chemical News" last Friday, is as follows.

The object of the meeting was to consider what action should be taken, in the interest of the trades concerned, to represent their views before the Joint Committee of the Lords and Commons appointed under the following resolution passed on Aug. 5 last:—

> "That it is expedient that a Joint Committee of Lords and Commons be appointed to consider and report whether any, and if any what, restrictions should be imposed on gas authorities with respect to the purchase and manufacture of the residual products resulting from the manufacture of gas by other authorities, or of other chemicals."

The Chairman referred to the action taken earlier in the year relative to certain provisions in the Wandsworth, Wimbledon, and Epsom District Gas Bill and other Bills, which would have given unlimited powers to gas companies—possessing, as they do, what is in the nature of a statutory monopoly—to actively compete with manufacturers and traders by selling and dealing in residual products.

The Chamber have petitioned against this Bill; and the Association of Tar Distillers have also joined in the opposition thereto. As the result of protracted negotiations by the Chamber and other opponents when the Bill passed through Committee, the following new clause was inserted in lieu of that originally proposed:—

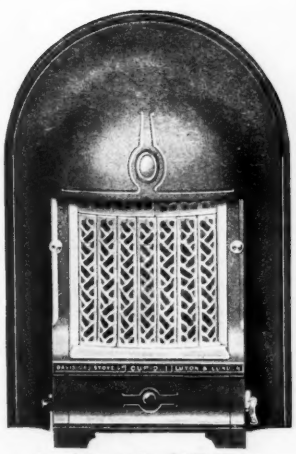
> "The company shall be established for the purpose of manufacturing, storing, and supplying gas for lighting, heating, motive power, and other purposes within the limits of supply as defined by this Act, and may convert, manufacture, and sell all residual products resulting from the manufacture of gas by them, and generally may carry on any business usually carried on by gas companies, but the company shall not purchase or use in any process of manufacture any materials other than those required for the making and supply of gas by them, or for the working-up of their own residual products, or for the construction, maintenance,

GAS FIRES.

Furthermore, these fires give this desirable result without the artificial aids of Flue-pipe and Chimney Draught.

"New Barless" Fires are GUARANTEED not to emit the slightest unpleasant odour even when first lighted.

"New Barless" Fires give perfect Hygienic and Thermal Efficiency.



Davis's "Cupid" Fire.
One of a big series of Hygienic Gas Fires.

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and repair of their gas-works, plant, and buildings, or for the maintenance and repair of gas-fittings."

After a brief discussion, the following resolutions were unanimously adopted :—

"That this joint meeting of the Chemical Trade Section of the London Chamber of Commerce (representing 373 members engaged in all branches of the chemical industry) and of the Association of Coal-Tar Distillers of the United Kingdom (representing the leading firms in the tar-distillers' industry) re-affirms previous resolutions passed by the said bodies objecting to the clause contained in certain Bills which have been before Parliament during the present session of Parliament, which, until amended as the result of negotiations, would have given powers to certain gas companies to manufacture chemical products beyond those which they have hitherto possessed.

"That this meeting support by evidence the case to be presented by the Alkali Manufacturers' Association before the House of Lords and House of Commons to consider any, and if any what, restrictions should be imposed on gas authorities with respect to the purchase and manufacture of the residual products resulting from the manufacture of gas by other gas authorities or of other chemicals."

A Special Committee was appointed (with power to act) to consider the resolution passed by the joint meeting, to decide as to the nature of the evidence to be given, and to select witnesses to appear before the Joint Parliamentary Committee.

METROPOLITAN WATER BOARD.

Deficiency Bill to be Dropped—Proposed New Offices.

At the Meeting of the Metropolitan Water Board last Friday, the Law and Parliamentary Committee submitted a Bill to amend the provisions of the Metropolis Water Act, 1902, and asked the Board to approve of it subject to such amendments as might be necessary. The scope of the proposed measure was indicated in the "JOURNAL" last week. Mr. Musgrave said the effect of the Bill would be to relieve London and Westminster from the obligations at present imposed upon them by Parliament. The Finance Committee have been guilty of neglect in not levying the deficiency rate. Mr. Tozer, the Chairman of the Finance Committee, admitted that to some slight extent there would be relief to the City under the Bill. But the Act of 1907 increased charges in the City by £38,000 and in Kensington by £5400. It decreased charges in Bermondsey by £1000, in West Ham by £3000, in Woolwich by £4000, and in Camberwell by £9000. Under the Bill, the City would be relieved of £1700 and Kensington of £280; while Bermondsey would pay £173 more, Woolwich £111 more, West Ham £502 more, and East Ham £184 more. He contended that the amounts were trivial. After some discussion, the recommendation to promote the Bill was defeated by two votes.

On the same occasion, the proposal to open negotiations for the acquisition of King's College Hospital for the central offices of the Board, introduced at the previous meeting, was again under discussion. Sir Melvill Beachcroft favoured the proposal; but an opinion was expressed by a member that the purchase and the adaptation of the building would cost £100,000. He urged utilizing the Board's land in Rosebery Avenue. The Chairman of the Committee concerned (Mr. Lyell) assured the members that to negotiate would not in any way bind the Board; and in the result the proposal of the Committee was agreed to.

NOTES FROM SCOTLAND.

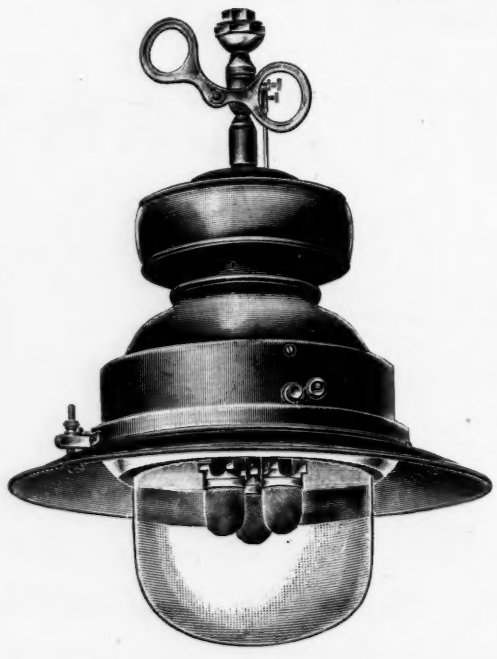
From Our Own Correspondents.

Saturday.

Edinburgh.—The first meeting of the Gas Commissioners of the Edinburgh and Leith Corporations for the current municipal year was held last Monday. Lord Provost Inches, who presided, was congratulated on his appointment to the chief civic chair. In reply, he referred to the interest he had always taken in the work of the Commission, and expressed the hope that he might be able to do some good for it during his term of office. The convenership of the Works Committee, formerly held by Mr. Inches, was filled by the unanimous appointment of Bailie Lindsay, of Leith, whose place as Convener of the Finance and Law Committee was given to Mr. M'Michael, of Edinburgh. The latter took occasion to remark that, in view of the recent forward policy, the Commission was entitled to be regarded as the most progressive and enterprising body in Edinburgh and Leith. It may be interesting to mention that during the month of October the gas made at the Granton works totalled 195,622,000 cubic feet, compared with 191,354,000 cubic feet in October, 1911; the increase being equal to 2·23 per cent. There were 301 cookers fixed, against 124; making a total of 13,034 now on hire, compared with 9290.

Dunfermline.—While both for the Dunfermline District Committee and the Dunfermline Town Council evidence is being prepared in support of the respective Provisional Orders by which power is being sought to harness the waters of the Devon, hope has not been abandoned of a settlement being arranged before the inquiries are made at the instance of Parliament. It is rumoured, on apparently good authority, that the Town Council will not have the same support from the Admiralty as they had on the occasion of the passing of the Burgh Extension and Drainage Bill, inasmuch as the Government are already partners to the extent of one-third with the District Committee in the

War Office Contract.



We have been entrusted by the War Office with a large contract for the supply of **No. 15 "Blanlite" Outdoor Lamps.**

We would recommend this up-to-date Lamp to the notice of every Gas Engineer who is requiring an absolutely Wind-proof and Scientifically Constructed Lighting Medium at a **very low figure.**

Suitable for Shop Fronts, Entrances, Platforms, Street Lighting and Exposed Positions.

BRITISH MADE.

THE BLAND LIGHT SYNDICATE, LTD., 63, Queen Victoria St., London, E.C. 2, Carr St., Blackfriars & Deansgate, Manchester.

Glenquey scheme, and the pipes to Rosyth, which are not being filled to anything like their full capacity, form part of the scheme.

Galashiels.—A serious gas explosion took place on Tuesday at "Eastmount," the residence of Mr. Harry Sanderson, situated on the outskirts of Galashiels. It appears that during the night there had been an escape of gas in a provision store adjoining the kitchen. In the morning, two servants entered the store with a light, when a bad explosion took place.

Perth.—The state of the gas-works continues to engage the attention of the Town Council. The recent inspection convinced the members that the retorts were in a condition requiring immediate attention. The arched brickwork is showing signs of collapse at several points.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 30.

Sulphate of Ammonia.

For the major part of the past week the market continued dull and uninteresting; but at the close the demand has improved for near delivery, and the tone has hardened to a certain extent, although there have still been cheap second-hand sellers. The purchasing has, however, been mainly for account of dealers; and the actual consumers have remained somewhat apathetic. To-day's quotations are £13 17s. 6d. per ton f.o.b. Hull, £13 18s. 9d. per ton f.o.b. Liverpool, and £14 per ton f.o.b. Leith. The forward position has been rather neglected; but it is reported that £14 5s. per ton, f.o.b. at the ports, has been accepted by producers for delivery the first half of next year.

Nitrate of Soda.

This market is quiet but steady at 11s. 9d. per cwt. for ordinary, and 11s. 10½d. for refined quality, on spot.

Manchester District Tar Prices.

It is officially announced that the average price realized for October deliveries of tar in the Manchester district—based on the value of the products—was 39s. 4d. per ton.

LONDON, *Dec.* 2.

Tar Products.

Business is still very quiet in tar products. There has been a little more inquiry for pitch during the past week. This is accounted for by the fact that the French State Railways have placed their orders for fuel, and the fuel manufacturers have all come into the market at once to cover their requirements for pitch. This has made the market a little steady for the time being. However, the reports from different quarters go to show that quotations are being made to the other side under the market equivalents here. Benzols remain about the same; but there are no fresh orders in the market. Solvent and heavy naphthas continue fairly firm. Crude carbolic shows little interest at the present moment, and business for forward is difficult to negotiate. Creosote remains very firm. A fair amount of business has transpired for both prompt and forward delivery.

The average values during the week were: Tar, 26s. 6d. to 30s. 6d. Pitch, London, 43s. to 43s. 6d.; east coast, 43s. to 43s. 6d.; west coast, Clyde, 43s. to 43s. 6d.; Manchester, 40s. 6d. to 41s. 6d.; Liverpool, 41s. to 42s. 6d. Benzol, 90 per cent., naked, London, 11d. to 11½d.; North, 10d. to 10½d.; 50-90 per cent., naked, London, 11d.; North, 10½d. to 10¾d. Toluol, naked, London, 11d. to 11½d.; North, 10½d. to 11d. Crude naphtha, in bulk, London, 5½d. to 5¾d.; North, 5d. to 5¼d. Solvent naphtha, naked, London, 1s. 1½d. to 1s. 2d.; North, 1s. 1½d. to 1s. 2d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10½d. to 11d. f.o.b. Creosote, in bulk, London, 3⅛d. to 3¼d.; North, 3d. to 3¼d. Heavy oils, in bulk, 3⅜d. to 3½d. Carbolic acid, casks included, 60 per cent., prompt east and west coast, 2s. 3d. to 2s. 4d.; forward 1s. 11d. to 2s. 1d. Naphthalene, £5 to £9; salts, 45s. to 50s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

There was a little more inquiry for this article during the past week; and the market may be taken as slightly better. Outside London makes are £13 5s. to £13 6s. 3d.; Hull, £13 17s. 6d.; Liverpool, £13 18s. 9d.; Leith, £14; Middlesbrough, £13 18s. 9d.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a heavier demand for coals, but inclement weather has to some extent impeded shipments. In steam coals, best Northumbrians are about 14s. per ton f.o.b.; second-class steams are 13s.; and steam smalls are from 9s. 9d. to 11s. The production has been well maintained, though occasionally a day is lost by some collieries through lack of ready steamers. In gas coals, the demand is nearly at its fullest for this season; and the prices are firm. For best Durhams, 15s. 6d. per ton f.o.b. is quoted; and for second-class, about 14s. to 14s. 6d. For "Wear" specials, 16s. 6d. per ton f.o.b. is quoted; and they are rather scarce. The contracts reported of late are not for large quantities, and the prices do not show so much variation. It will be seen that the quotations this week for gas coals show an advance on the recent prices. The contract for gas coal for Malmo has been allotted for "special" Durham gas coal at a little over 20s. per ton, delivered at the Swedish port over next year—the quantity being near 21,000 tons. Coke is firm in price. Gas coke is in much better output, and the prices are lower—good makes being about 22s. per ton.

Scotch Coal Trade.

There are indications that prices are about to harden throughout the coal trade all over the Scottish coalfields. On Friday, the following were the quotations f.o.b. Glasgow: Steam coal, 11s. 6d. to 12s.; splint, 14s. to 14s. 6d.; ell, 12s. 3d. to 12s. 9d.; trebles, 12s. 6d. to 13s.; doubles and singles, 12s. to 12s. 6d.

COAL STRIKE *VERSUS* WATER GAS PLANTS.

Have you considered the advantages of a

WATER GAS PLANT

for your own Works as adopted at

CLEETHORPES GAS-WORKS	..	Oil or Benzol Carburetting.	
CWMBRAN	,,	..	Benzol ,,
CHELMSFORD	,,	..	Oil ,,
FELIXSTOWE	,,	..	Benzol ,,
ILFRACOMBE	,,	..	,, ,,
NEWTON ABBOT	,,	..	Oil ,,
NEW MILLS	,,	..	,, ,,
PRESCOT	,,	..	Tar ,,
RUSHDEN	,,	..	Benzol ,,
SNODLAND	,,	..	Tar ,,
TYLDESLEY	,,	..	Oil ,,
BARKING	,,	..	,, ,,

Plants made from 50,000 cubic feet per day upwards and to suit local conditions.

Prices and Particulars from—

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London Office: 165, Gresham House, Old Broad Street, E.C.

New Issues of Gas and Water Capital.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards placed three new issues of capital by order of Directors. The first lots consisted of £5 "B" shares in the Pinner Gas Company, Limited, ranking for a standard dividend of 7 per cent., but, as from the 18th inst., giving the purchasers a right to a proportion of the entire dividend (the last paid was at the rate of £9 5s. 6d. per cent. per annum) for the year ending June 30, 1913, which, in view of the reduction made in the price of gas at Midsummer last, is expected to be at the rate of £9 12s. 6d. per cent. per annum. They were all sold at £9 to £9 5s. each. Next came a new issue of 400 additional ordinary £10 shares (7 per cent.) and £1000 of 4 per cent. perpetual debenture stock of the Lowestoft Water and Gas Company. The shares, on which a dividend of 5¼ per cent. per annum will commence to accrue from the day of the payment of the purchase-money, fetched from £10 7s. 6d. to £10 12s. 6d. apiece; and the stock was placed at from par to 10s. premium per £100. The final lots consisted of some 6 per cent. non-cumulative preference shares of £10 each and £2000 of 5 per cent. perpetual debenture stock of the Hythe and Sandgate Gas Company. Both the shares and the stock were sold at par.

Fatality at the Beckton Gas-Works.

An inquiry was held last Thursday, by Mr. G. E. Hilleary, Coroner for the County Borough of West Ham, relative to the death of John Chillcot (48), a pipe-cleaner at the Beckton station of the Gaslight and Coke Company. Mr. C. Beasley Robinson (of Messrs. Monier-Williams, Robinson, and Milroy) appeared for the Company. Henry William Luck, the foreman in No. 1 retort-house, deposed that he saw the deceased early on the morning of the previous Sunday, and he told him (witness) that he had hurt himself. He said he was pulling a trestle backwards in No. 3 retort-house when he caught his foot against a plate, fell, and the trestle dropped on to his stomach. Witness had him removed to the Seamen's Hospital. The trestle was made of iron, and weighed about 100 lbs. It was part of deceased's duty to move it. He would put three planks upon it, and then scurf the retorts. The floors of the retort-houses were of iron, and some of them were very smooth. The place was well lighted with a high-pressure lamp. In answer to Mr. Robinson, witness said he could not say how the accident happened; he thought it was purely an accident. Dr. W. Forbes Beattie, the House Surgeon at the Seamen's Hospital, deposed that when the deceased was admitted early on Sunday morning he complained of pains in the lower part of his stomach. He was operated upon in the afternoon, and died on Monday evening. A *post mortem* examination was made immediately. The cause of death was extensive bruising of the bowel coupled with perforation of the gut; and he thought these injuries could not have been produced in any other way than that described. After a brief consultation, the Jury returned a verdict of "Accidental death."

"Shadowgraph" Test Demonstrations and Lectures.

We understand that the Davis Gas-Stove Company have for some time past been busily engaged in giving "Shadowgraph" demonstrations and lectures on gas-fire construction. Since the beginning of the season, two lectures a week, on an average, have been delivered in various parts of the country—the ground covered including Scotland and the North and South of England. On every occasion the lectures and demonstrations were received with the greatest interest and enthusiasm; and the opinion has been expressed by several prominent gas engineers after the lectures that the Company have rendered an extensive service to the gas profession in perfecting and introducing this new standard test of stoves for hygienic efficiency. During the past week, the Chief of the Company's Technical Staff gave a very interesting lecture to about a hundred of the Bournemouth Gas and Water Company's officials, another to a large gathering of the staff of the Northampton Gas Company, and a third before an audience of gas officials, experts, and students at the Technical Institute.

Church Stretton Water Arbitration.—Owing to the pressure on our space, it has been necessary to hold over till next week the conclusion of the report of the proceedings in this arbitration, commenced in the "JOURNAL" last week (p. 692).

Oldbury Gas Undertaking.—The quantity of gas sent out by the Oldbury gas undertaking during the six months ending Oct. 31 was 77,039,000 cubic feet, against 72,680,000 cubic feet for the corresponding period of last year—an increase of 4,359,000 feet, or 6 per cent.

Chertsey Gas Company's Jubilee.—At the fiftieth annual meeting of the Chertsey Gas Consumers' Company, the Chairman (Mr. W. Moir) announced that the price of gas would be reduced 1d. per 1000 cubic feet to ordinary consumers from January next. He gave some interesting particulars with regard to the early history of the enterprise, and remarked that after fifty years' working the undertaking was a very satisfactory one to the shareholders. The statutory dividends were declared, and the Manager (Mr. H. J. Hamilton) was thanked for his successful effort to maintain the supply of gas at the time of the coal strike.

Salford Gas-Works Extensions.—At a meeting of the Salford Town Council to-morrow (Wednesday), the Gas Committee will present a further report with reference to the proposed extension of the gas-works. When the matter was last before the Council, it was decided, after considerable discussion, that the proposals of the Gas Committee for the acquirement of land in Liverpool Street be referred back, so that further expert advice might be obtained as to the value of the site proposed to be acquired. The Gas Committee, having obtained such advice, now ask the Council to confirm the resolution for the purchase from the Earl of Ellesmere, for gas-works purposes, of a plot of land in Liverpool Street containing 38,790 square yards, at a total cost (including payments for paving charges, buildings, and plant upon the land, new roadway, and boundary walls, &c.), of £53,000.

NATIONAL INSURANCE COMMISSION.

Important Decision.

After consideration of the special apparatus offered by various manufacturers, H.M.O. Works have accepted our tender for the supply of the extensive installation of gas and steam apparatus required for cooking, &c., at the NATIONAL INSURANCE COMMISSION Offices, Leonard Street, London, E.C.

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

Truro Gas Company and the Electric Light.

The question of the erection of electric light works at Truro continues to occupy a good deal of attention in the city. Since the Gas Company decided to apply for a Provisional Order, the City Council have also been considering the subject—there being a feeling on the part of a number of inhabitants that it would be undesirable for one Company to have a monopoly of lighting powers. Last Tuesday a conference took place between representatives of the Corporation and the Company, with the object of considering the situation, and, if possible, of arriving at an agreement. The Gas Company were represented by Mr. John James (the Chairman), Mr. W. Bryant (a Director), and Mr. S. J. Ingram (the Manager). It was pointed out that if both the Corporation and the Company applied for powers, the costs were likely to be heavy; and it was recognized that if either procee ded with the application, the other party would be entitled to have inserted in the Order clauses which would protect its interests. A special meeting of the City Council was held on Thursday, to pass formal resolutions authorizing application for a Provisional Order. In the course of the discussion, the Mayor stated that he had heard nothing further as to the intention of the Gas Company. Mr. Crewes said he thought there ought to be a compromise on the basis put forward by the Company. He understood the Company were determined to proceed, unless a compromise could be arranged on the terms suggested at the conference. He agreed that it was undesirable to let a monopoly be set up; but the question was whether they would not have more to pay to prevent the monopoly than they would have to pay with it. The resolution was carried—only Mr. Crewes dissenting.

Chard Corporation Gas-Works.—In a statement to the Chard Town Council yesterday week on the finances, Mr. Spencer, the Borough Accountant, said the gas-works were a credit to the Gas Committee and the Manager (Mr. A. S. Brook). The capital expenditure to date was £58,000, of which £10,652 had been redeemed; and the undertaking had credit balances of £740 in the reserve fund and £937 in the renewals fund.

Gas v. Electricity at Dawlish.—Some correspondence has been going on in the columns of an Exeter paper on the cost of electricity as compared with gas. In the course of it, a correspondent who signed himself "Light" referred to the experiment which was carried out at Dawlish with a view to ascertaining the relative cost of the two illuminants. He said: The Electric Light Company—a new one—asked permission of the Dawlish Urban Council to put up as a test six electric lamps for street lighting, of a candle power of 250. The Gas Company, who hold the contract for public lighting, agreed conditionally on their being allowed to put up six new gas-lamps of the same power. It was so agreed. The bills to the Council for the twelve months ended Oct. 16 last were as follows: Electric light, £31 7s.; gas, £7 19s. 7d. "A test indeed!" is the correspondent's comment.

Tribute to Tyldesley's former Gas Manager.

At a meeting of the Tyldesley District Council last week, Mr. Brown, in moving that the seal of the Council be attached to a testimonial to Mr. Williams (who recently resigned his position as Gas and Water Manager on acceptance of an appointment with the Altrincham Gas Company), presented some statistics showing how the Gas Department had progressed during the time that gentleman had been their Manager. In 1907, the sale of gas equalled 39 million cubic feet; while in 1912 it had risen to 45 millions, or an increase of 15 per cent. In the same period, there had been a remarkable increase in the price of coal, which had necessitated very careful management to achieve the results they could boast of. Coal in 1907 was about 9s. 11d. per ton, then it increased to 12s. 5d., and this year they were paying 14s. 2d. per ton for the same quality. In the past five years, the number of gas consumers had increased from 2500 to 3100, which had necessitated a large outlay on services and meters. The plant at the gas-works had been augmented; the additions including a carburetted water-gas plant, which was paid for out of revenue, and proved extremely useful during the recent coal strike. All the plant had also been thoroughly overhauled; and the method of dealing with the accounts kept at the works had been re-arranged. Considering the large amount of subsidence to which Tyldesley as a colliery centre was subject, it was creditable that the unaccounted-for gas had not exceeded an average of 10 per cent. Some years ago, it was asserted that gas would never be cheap in Tyldesley; but thanks to Mr. Williams' management, and his close attention to the commercial side of the department, they were able in 1909 to reduce the price from 3s. 4d. to 3s. 1d. per 1000 cubic feet net, and during the present year it was further reduced to 2s. 11d. A corresponding reduction had also been made to consumers for power and cooking purposes. The amount of the credit balance was a compliment on the management, for it had increased from £78 in 1907 to £2100 in 1912, despite the fact that they had paid for the gas plant, and other repairs and additions, about £1300. These figures were sufficient to show that Mr. Williams was worthy of the testimonial they were giving him. Other members having spoken to the resolution, which was cordially adopted, Mr. Williams returned thanks. He said that not on a single occasion had he had, during his five years' term of office, to complain of the treatment received from any member of the Council. On the contrary, the greatest courtesy and kindness had been extended to him by everyone; and in this connection he specially referred to the Chairman of the Gas Committee.

The Gas Classes at the Westminster Technical Institute.—At the meeting of the London County Council last Tuesday, the recommendations of the Education Committee in regard to the appointment of a workshop instructor for joint-wiping for the Gaslight and Coke Company's apprentices, referred to under the above heading in the "JOURNAL" last week (p. 698), were agreed to.

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Dublin Water-Works Litigation.—In the Chancery Division of the High Court of Justice in Ireland before Mr. Justice Barton, a consent was received and made a rule of Court in the case of *Dublin Corporation v. M'Kee and M'Nally*. Mr. White, for the plaintiffs, said the defendants were contractors for the construction of an additional reservoir at Roundwood (Co. Wicklow), where the Dublin Water-Works were situated. An action had been instituted to restrain the defendants from removing plant, machinery, and materials from the works owing to certain matters being in dispute, and an interlocutory injunction had been granted pending the hearing of a notice of motion [see *ante*, p. 699]. It had now been agreed that the notice should be taken as the trial of the action, and a perpetual injunction granted.

A "Forward Policy" at Hastings.—Correspondence has been taking place in the local "Evening Argus" with regard to the necessity for doing something to push Hastings and St. Leonards more to the front; and one of the letters is from Madame Amy Wolfen—a lady who has taken much interest in local matters. After asking what has been done to adopt a "forward policy," she answers her own question as follows: "The forward policy of late years was evinced in purchasing the electric light works just at a time when the owners were realizing they were not efficient for demands, and at a figure which for years has been an increased expense to the ratepayers. To manipulate figures to make it appear we are not losing so much in the working of the electric light, the efficient gas-light in streets has at great expense been replaced by less efficient electric light."

APPLICATIONS FOR LETTERS PATENT.

26,420.—Tournier, V. C., "Reducing valves." Nov. 18.
26,421.—Cockburn, D., and MacNicoll, D., "Stop-valves." Nov. 18.
26,422.—Dugmore, W. H. L., "Cooker." Nov. 18.
26,426.—d'Olivier-Mansan, M. G. C. R., "Treatment of tar, &c." Nov. 18.
26,443.—Sturgeon, J. E., "Electrical ignition systems." Nov. 18.
26,609.—Rooke, T., "Gas-meters." Nov. 20.
26,686.—Alexander, W., "Dry gas-meters." Nov. 20.
26,715.—Cheshire, W. D., and Weippert, E. D., "Gas-meters." Nov. 21.
26,790.—Regondi, G., "Pressure-valves." Nov. 21.
26,796.—Moeller, J., "Production of gas." Nov. 21.
26,799.—Smith, H. E., "Connectors for gas-pipes." Nov. 21.
26,849.—Oglesby, S. W., Ayton, F. R., and Hugh Stevenson and Sons, Ltd., "Boxes for mantles." Nov. 22.
26,883.—Kent-Johnston, A. G., "Igniting gas." Nov. 22.
26,916.—Stephenson, J., and Firth Blakeley, Sons, and Co., Ltd., "Generation of carburetted water gas." Nov. 22.
26,932.—Potter, W. G., "Gas-making machines and lamps." Nov. 23.

A Derbyshire Gas Company's Progress.—The annual report of the Chapel Whaley and Chinley Gas Company shows that satisfactory progress continues to be made by this new concern. For the twelve months ending Sept. 30, there is a disposable profit of £1936; and the Directors recommend the payment of a dividend of 4 per cent. (less tax), and the placing of £216 to the special purposes fund, carrying forward £500. A new gasholder has been completed, and is working satisfactorily. Of 20,000 new shares offered for sale by tender, 17,232 were taken up by the end of the financial year.

Gas Lighting for Kingskerswell.—A deputation from the Torquay Corporation, consisting of Mr. C. Waymouth (the Chairman of the Gas Committee), Mr. F. S. Hex (the Town Clerk), and Mr. F. Chalmers (the Manager of the St. Mary Church Gas-Works), waited on the Kingskerswell Parish Council at their last meeting. Mr. Hex stated that, in response to the circular sent to the inhabitants asking if they were prepared to adopt gas lighting in their homes if facilities were provided, the Corporation had received assurances which warranted them going forward with their application for powers to extend the gas-mains to the village. The Corporation would undertake all the work of supplying houses and collect the accounts; gas being furnished at 1s. per 1000 cubic feet more than the prevailing price at St. Mary Church. At the present price, the Kingskerswell consumers would pay 4s. per 1000 cubic feet for ordinary meter supplies, and 5s. for supplies through slot-meters. They would supply gas at 4s. per 1000 cubic feet for public lighting, if it were desired. The Parish Council unanimously approved of a Provisional Order being obtained by the Corporation to include the parish within their supply area.

The Gas Committee of the Bolton Corporation have accepted the tender of Messrs. R. & J. Dempster for the construction of a four-lift spiral gasholder at their Lum Street works.

The Ashton, Stalybridge, and District Joint Water-Works Committee have decided to make a call of £7000 for the year upon its constituent authorities: Ashton, £2518; Stalybridge, £1798; Dukinfield, £1079; Moseley, £729; Hurst, £437; Audenshaw, £439.

A strange deadlock has occurred in a poll at Bramshot, Hants, with respect to a water supply for the parish. Two questions were submitted on the ballot papers; the voter being required to state "Yes" or "No" to each. The first was that confirmation should be given to a resolution passed by the Parish Council in August last, to the effect that negotiations with the Wey Water Company should be terminated, and that the Council be requested to prepare an independent scheme for acceptance. The voting on this was: Ayes, 141; Noes, 50. The second question was an amendment, to the effect that the offer of the Wey Water Company be recommended to the Parish Council for acceptance as the fairest manner of dealing with the subject; and on this the Ayes were 117, the Noes being 60. The Returning Officer declared that both were carried, though the terms were opposite. A second poll will probably have to be taken, in which the ballot papers will distinctly specify but one issue.

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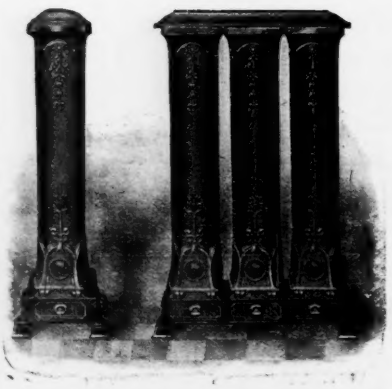

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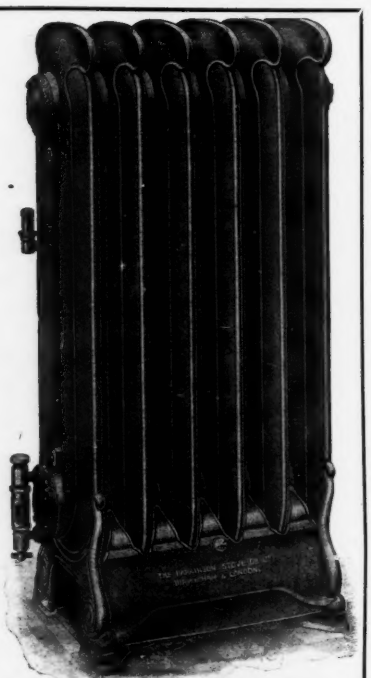

THE
PARKINSON STOVE CO., Ld.
BIRMINGHAM & LONDON.

At an extraordinary general meeting of the Bailiffe Bridge Gas Company, Limited, held recently at the offices of the Company at Bailiffe Bridge, near Brighouse, a resolution was passed that the Company should be wound up voluntarily.

At the Market Hotel, Bacup, last Thursday, five new £10 shares (fully paid) in the Rossendale Union Gas Company were sold for £21 7s. 6d. each. One new 5 per cent. preference share in the same Company, £10 nominal (£4 paid), sold for £4 10s. 6d.

Messrs. Ed. Bennis and Co., Limited, of Little Hulton, Bolton, have secured a repeat order from the Derby Gas Company for four mechanical stokers for Lancashire boilers at their Litchurch works, and an order from the Birmingham Gas Department for four independent elevators at the Windsor Street works.

The Shipley Urban District Council have for a long time had complaints in regard to the quality of the gas supplied and the trouble caused by the presence of naphthalene in the mains and service pipes; and the Gas Committee have now instructed the Engineer and Manager (Mr. H. Blakey) to prepare a plan and estimate for the provision of new condensing plant and a naphthalene washer.

A Stratford printer's labourer named Edward Hastings, who had been erratic in his behaviour for the past six months, was some days ago found dead by his wife under circumstances which led the Coroner's Jury to return a verdict of "Suicide during temporary insanity." He was lying on the floor with a sheet covering his head, and in his mouth was one end of a bicycle inner tube, the other end of which was attached to a tap on the gas-stove. The room was full of gas.

In connection with a Trades Exhibition which is being held this week at Fleet, the Aldershot Gas, Water, and District Lighting Company are making a display which should prove profitable from a business point of view. At their stall, they are demonstrating in an attractive manner the many uses to which gas can be put; and so that their efforts may bear the best fruit, they are issuing to consumers or prospective consumers free tickets of admission to the exhibition. Both inside and out, the hall is illuminated by high-power low-pressure lamps. As already notified in the "JOURNAL," the Company are reducing the price of gas; and the charge in this district, after the reading of the meters for the Christmas quarter, will be 3s. per 1000 cubic feet, with a rebate of 4d. for gas registered separately and used for heating cooking, or power purposes.

GAS COMPANIES' STOCK AND SHARE LIST.

The Stock Exchange has had a quiet week without any strong emotion to agitate it. Things would have gone better if the seemingly protracted preliminaries to an armistice in the East could have quickened up, and peace been brought a little nearer to view; but, on the other hand, they might easily have gone worse if markets had been at all strained. Meanwhile, the public is content to wait a bit and watch for developments. The opening on Monday was decidedly dull at dark views as to the political outlook; and the close was much the same, though the tendency slightly swayed from time to time during the day. Gilt-edged were weaker, and Consols fell ⅛. Rails were lower; and the Foreign Market apprehensive. Tuesday was better and brought some moderate recoveries, but no more activity. All leading departments were firmer. Wednesday began very cheerfully in response to reassuring signs in the East. But business did not quicken up much; and the enthusiasm abated. However, most markets closed a bit better. Government issues were steady; and Rails and American rose moderately. Thursday was very quiet, but the tone was good; the settlement going satisfactorily. Slight advances in the chief markets were the rule. On Friday, markets were less buoyant, owing to realizations. Consols were, however, put up ⅛ money and ⅜ account; "bears" being caught short. The rest were dullish. Saturday was bright and cheerful (though still very quiet) on war news. Gilt-edged were firm, Consols rose another ⅛, several Rails advanced, and the Foreign Market was strong and calm. Consols closed at 75¼ to 75½ for money, and ¼ better for the account. In the Money Market, rates hardened as the month's end approached; but discount closed easier. Business in the Gas Market was scarcely so active as in the week before; but the firmness was even more marked, with a longer array of advanced quotations. In Gaslight and Coke issues, the ordinary exhibited only a moderate aggregate of transactions; but the prices crept up steadily, almost day by day, from 102⅜ to 104½—a rise of 1. In the secured issues, each stock advanced ½. The maximum realized 83¼ and 84, the preference 101½ and 102, and the debenture from 77⅝ to 78¼. South Metropolitan was quiet and firm, changing hands at 116½ to 117¾—a rise of ½. The debenture made 77. In Commercials, the 4 per cent. was done at 107 and 107½, the 3½ per cent. at 102 and 102½, and the debenture at 74. Among the Suburban and Provincial group, Alliance and Dublin was marked at 76, Brentford new at 200 and 202 (a rise of 1), Hastings 3½ per cent. at 91½, and South Suburban at 119 and 120. Bournemouth old and Wandsworth "B" rose 1 each. On the local Exchange, Liverpool "A" was done at 220 (a rise of 4), and ditto "B" at 157½—a rise of 2½. In the Continental companies, Imperial changed hands at 176 to 177½, and European at 19 to 19⅜. Among the undertakings of the remoter world, Bombay realized 6⅝, Buenos Ayres debenture 94½ and 95 (rise of 1), Primitiva from 6 5/16 to 6 9/16, ditto preference from 5 to 5⅛, River Plate debenture 94½ (a rise of 1), and San Paulo debenture 50½ and 51.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 11	5	Alliance & Dublin Ord.	76–81	..	6 3 5
374,000	Stk.	July 12	4	Do. 4 p.c. Deb.	89–91	..	4 7 11
250,000	5	Oct. 11	7½	Bombay, Ltd.	6⅞–6⅞	..	5 9 1
50,000	10	Aug. 29	15	Bourne-mouth Gas and Water Pref. 10 p.c.	29–30	+1	5 0 0
332,000	10	,,	7	Do. B 7 p.c.	15½–16½	..	4 6 2
75,000	10	,,	6	Do. Pref. 6 p.c.	14–14½	..	4 2 9
380,000	Stk.	Aug. 14	13½	Brentford Consolidated	257–262	..	5 3 1
330,000	,,	,,	10½	Do. New	198–203	+1	5 3 5
50,300	,,	,,	5	Do. 5 p.c. Pref.	116–118	..	4 4 9
206,250	,,	June 14	4	Do. 4 p.c. Deb.	96–98	..	4 1 8
218,230	Stk.	Aug. 29	11	Brighton & Hove Orig.	210–215	..	5 2 4
244,200	,,	,,	8	Do. A Ord. Stk.	152–155	..	5 3 2
530,000	20	Sept. 27	12½	British	44½–45½	..	5 9 11
120,000	Stk.	June 28	4	Do. 4 p.c. Deb. Stk.	91–93	..	4 6 0
245,771	Stk.	June 28	4	Buenos Ayres 4 p.c. Deb.	94–56	+1	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	2–3	..	—
160,000	10	—	—	Do. 4½ p.c. Pref.	3½–4½	..	—
100,300	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	70–73	..	6 3 3
157,150	Stk.	Aug. 29	5	Chester 5 p.c. Ord.	110–112	..	4 9 3
1,513,280	Stk.	Aug. 29	5/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2
560,000	,,	,,	5½	Do. 3½ p.c. do.	101–103	..	5 3 6
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	73–75	..	4 0 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	80–83	..	4 16 5
200,000	,,	,,	7	Do. 7 p.c. Pref.	133–135	..	5 3 8
492,270	Stk.	—	5¾	Derby Con. Stk.	124–125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103–105	..	3 16 2
1,002,130	10	July 26	10	European, Ltd.	19–20	..	5 0 0
1,160,600	Stk.	Aug. 14	4/17/4	Gas-light & Coke 4 p.c. Ord.	103–105	+1	4 12 9
2,600,000	,,	,,	3½	Do. 3½ p.c. max.	82–85	+½	4 2 4
4,062,235	,,	,,	4	Do. 4 p.c. Con. Pref.	100–102	+¼	3 18 5
4,531,705	,,	June 14	3	Do. 3 p.c. Con. Deb.	77–79	+½	3 15 11
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	91–93	..	5 7 6
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	16–16½	..	6 13 4
131,000	Stk.	Sept. 13	7⅝	Ilford A and C	154–157	..	4 17 1
65,780	,,	,,	6⅛	Do. B	121–123	..	4 19 7
65,500	,,	June 28	4	Do. 4 p.c. Deb.	91–93	..	4 6 0
4,940,060	Stk.	Nov. 14	9	Imperial Continental	175–180	..	5 0 0
1,235,000	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	86–88	..	3 19 7
200,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c.	122–125	..	4 16 0
561,000	Stk.	Aug. 29	10	Liverpool United A.	220–222	+4	4 10 1
718,100	,,	,,	7	Do. B.	158–160	+2½	4 7 6
306,083	,,	June 28	4	Do. Deb. Stk.	100–102	..	3 18 5
63,480	Stk.	June 28	3	Maidstone 3 p.c. Deb.	69–71	..	4 4 6
75,000	5	Nov. 28	6	Malta & Mediterranean Met. of Melbourne 4½ p.c. Deb.	4½–4¾*	..	6 6 4
250,000	100	Oct. 1	4½		99–101	..	4 9 1
541,930	20	Oct. 30	3½	Monte Video, Ltd.	11½–12	+½	5 16 8
1,775,892	Stk.	July 26	4⅜	Newc'tle&G'teah'd Con.	99½–100	..	4 7 6
529,705	Stk.	June 28	3½	Do. 3½ p.c. Deb.	87–88	..	3 19 7
55,940	10	Aug. 29	7/7/0	North Middlesex 7 p.c.	13½–14½	..	5 1 5
300,000	Stk.	Nov. 28	8	Oriental, Ltd.	125–130*	..	6 3 1
60,000	5	Sept. 27	10	Ottoman, Ltd.	8½–8⅝	..	5 14 3
60,000	50	Aug. 14	13	Portsea Island B	127–130	..	5 0 0
100,000	50	,,	12	Do. C	124–127	..	4 14 6
249,980	5	Oct. 11	8	Primitiva Ord.	6⅛–6⅜	..	5 18 6
499,960	5	June 28	5	Do. 5 p.c. Pref.	5–5¼	..	4 15 3
521,600	100	June 1	4	Do. 4 p.c. Deb.	96–98	..	4 1 8
346,198	Stk.	June 28	4	River Plate 4 p.c. Deb.	94–96	+1	4 3 4
275,000	5	Apl. 12	12	San Paulo, Ltd.	13–14	..	4 5 9
150,000	10	Sept. 27	6	Do. 6 p.c. Pref.	11½–12	..	5 0 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49–51	..	4 18 0
135,000	Stk.	Aug 29	10	Sheffield A	230–232	..	4 6 2
209,984	,,	,,	10	Do. B	230–232	..	4 6 2
523,500	,,	,,	10	Do. C	229–231	..	4 6 7
90,000	10	Sept. 27	7½	South African	9–10	..	7 10 0
6,429,895	Stk.	Aug. 29	5/9/4	South Met., 4 p.c. Ord.	116½–118½	+½	4 12 2
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	76–79	..	3 15 11
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	163–165	..	5 3 0
605,000	Stk.	Aug. 14	5/16/8	S'th Suburb'n Ord. 5 p.c.	119–121	..	4 16 3
60,000	,,	,,	5	Do. 5 p.c. Pref.	117–119	..	4 4 0
117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	120–122	..	4 2 0
594,740	Stk.	Nov. 14	5	Southampton Ord.	102–105	..	4 15 3
120,000	Stk.	Aug. 14	7½	Tottenham A 5 p.c.	142–145	..	5 0 0
483,940	,,	,,	5¾	and B 3½ p.c.	114–116	..	4 19 2
149,470	,,	June 28	4	Edmonton 4 p.c. Deb.	94–96	..	4 3 4
182,380	10	June 15	5	Tuscan, Ltd.	8½–8⅝	..	5 15 11
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97–99	..	5 1 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	115–115½	..	4 6 7
255,636	Stk.	Aug. 29	6⅞	Wandsworth B 3½ p.c.	139–142	+1	4 16 10
85,766	,,	June 28	3	Do. 3 p.c. Deb. Stk.	70–72	..	4 3 4

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